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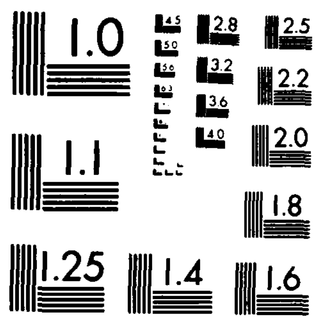
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LONGITUDINAL STUDY OF
THE PROGRAMS AND THE ORGANIZATION OF
A DIVISION OF THE CORPS OF ENGINEERS

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A thesis submitted to the Massachussetts Institute of Technology in partial fulfillment of the requirements of the degrees of CIVIL ENGINEER and MASTER OF SCIENCE IN CIVIL ENGINEERING.

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by

THOMAS A. HOLDEN JR.

Bachelor of Science
United States Military Academy
(1975)

Submitted to the Department of
Civil Engineering
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in Partial Fulfillment of the
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CIVIL ENGINEER
and
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at the

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ABSTRACT

The objective of this thesis is to analyze the changes in the organization of public works departments over an extended period of time and to ascertain the reasons therefore. This is accomplished through a longitudinal study of the New England Division of the Corps of Engineers (NED) covering a twenty eight year period from 1955 through 1983.

Financial records are analyzed to identify the nature and extent of program changes. On this basis the twenty eight year study period is discretized into five distinct periods with associated hypotheses.

Using an analytical framework for classifying the organization, the way in which it is fragmentated into subelements and the nature of the mechanisms for activity integration within each period are then categorized. Analysis of the organization is accomplished along three dimensions: differentiation of organization structure, methods of formal coordination and informal methods. These analyses rely upon data obtained from organizational charts, project files, and semi-structured interviews with key informants respectively. Each of these analyses results in alternative, sometimes competing classifications of the organization.

These alternative assessments are then analyzed resulting in an overall assessment of the organization. The most significant variables influencing the changes

from one period to the next are also identified. This analysis of the New England Division showed that the organization is extremely open to outside influence arising from social, political and economic considerations which are in turn intimately related to the programs the organization is charged with implementing.

Thesis Supervisor: Dr. Henry G. Irwig

Title: Winslow Associate Professor of Civil Engineering.

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Special thanks are given to Col. C. B. Sciple for availing his organization to open and rigorous evaluation during the conduct of this thesis. Without his complete support enabling freedom of movement within NED, this effort could not have been successful. Special thanks also are given to the professional personnel of NED whose insights, guidance and assistance contributed immeasureably to the research. Mr. Fryar and Mr. Ignazzio for availing their respective divisions openly to investigative study. Bill Scully for helping in the formulation stages of the research effort, thereby enhancing the development of its framework. Bill McGondel for his keen insights and wealth of historical records. Frank Notardonato and A. Doyle for their keen insights into the project management implementation process during the period of study. All the personnel interviewed who willingly contributed their time and knowledge of the organization making the study enjoyable as well as rewarding. Lastly, a very special thanks to Mary Mirabelli for patience and perseverance in assisting me identify and track down project records during the conduct of this study.

Without question, my thesis advisor Professor Henry Irwig is awarded a hearty congratulations for having successfully guided me through this endeavor. His insights, experience and cooperation in support of this research contributed immeasurably to its success.

Lastly, I would like to thank my wife Diane and my children, Christina and Jamie, for providing a stabilizing element during my trying times as an MIT student. Without their love and understanding I would have been hard pressed to retain my sense of humor and direction. As unsung heroes they most surely deserve recognition in the awarding of the graduate degree.

Thomas A. Holden Jr.

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1. INTRODUCTION.

As the nation focuses its attention on the redesign and subsequent redevelopment of its infrastructure, concerns have arisen regarding the ability of public works organizations charged with this task. Questions of ability, capacity and effectiveness have come to the forefront. (2, 22 & 33) Recent trends towards public accountability, open planning, increased regulatory action demanding program effectiveness, as well as a push towards program austerity all have served to constrain public works organizations. This has been manifested by decreases in size, loss of trained personnel and shifts in organizational priorities all contributing to program decline. As a result, public works organizations have undergone considerable reorganizations.

Several recent studies such as the implementation of investment programs by the Spannish National Railroad (RENFE) undertaken by faculty and students in the Center for Construction Research and Education at MIT suggest that these factors often have impaired the ability of the public sector to undertake new major investment programs. (2) In addition, symptoms of inadequate capacity were noted in three other studies: the New Jersey Department of Transportation, Massachusetts Department of Public Works

and the California Department of Public Works Division of Architecture. These symptoms were;

-Lack of coordination between projects related to the same site.

-Excessive amounts of design which is never implemented or implemented with large delays or excessive change.

-Insufficient control of the work of design consultants.

-Inadequate maintenance and development of standards, and cost and schedule data.

In addition, the most prevalent symptom was that continuation at a "normal level" of program implementation on a reduced scale often seemed to overtax the capacity of the public works organization. (2, 22 & 33)

The initial issue was whether to focus on a single organization or multiple organizations. Since the intent of this thesis was to focus on the process of adaptation and change, the study of a single organization containing an abundance of historical records would provide the best insight into this process. This resulted in the selection of the New England Division of the Corps of Engineers.

The next issue was the level of quantification to be employed in the analysis of data. Since the focus on processes required comprehensive investigation of the

organization, it was necessary to select a level of quantification which would enable an 'all encompassing' analysis drawing upon multiple data sources. As a result, a qualitative methodological approach was selected. A more comprehensive description of this type of study is presented in section 1.2.

1.1. Thesis Objective.

The objective of this thesis is to identify the organizational factors influencing the sustainment of public works organizational capacity in the implementation of investment programs over an extended period of time. This will be accomplished through a type 1 qualitative longitudinal study of the New England Division (NED) of the Corps of Engineers covering a 28 year period from 1955 through 1983. Focus will be on analysis and identification of the variables and mechanisms of adaption resulting from the interaction of external demands upon organization structure and processes. This will encompass assessment of organization structure and activity integration during a period of organizational decline. Analysis will center on identification of causation and directionality enhancing and/or impeding the organization in implementing investment programs.

1.2. Research Approach.

In order to achieve the broad objectives outlined in the previous section, selection of an appropriate research and analysis technique is required. From the outset, it was obvious that attainment of the study goals would require detailed analysis of numerous variables both exogenous and endogenous to the organization. It was hypothesized that the relationships between these variables over the 28 year period under study would change. Since data was to be obtained from several sources within NED (historical files, project files and interviews), compatability of the research approach with the theoretical framework was essential if findings validity was to be ensured. Thus the decision initially was how to capitalize upon the abundance of available information at NED through selection of the most appropriate research approach for study of a single organization: cross-sectional comparative study or longitudinal study.

1.2.1. Longitudinal versus Cross-Sectional Comparative Study.

A cross-sectional comparative analysis focuses on developing a snap-shot of the organization under study at specific intervals in time. It utilizes correlation analysis to extract pertinent findings by mathematically

relating the data of two or more distinct periods for comparison.

The longitudinal analysis as defined by Kimberly (37) involves "those techniques, methodologies and activities which permit observation, description and/or classification of organizational phenomena in such a way that processes can be identified and empirically documented." Hence, it can assess any sequence changes in organization variables such as changes in direction or relationships.

Thus the cross-sectional study analyzes data at two or more distinct periods of time and attempts to correlate the results through a mathematical manipulation which produces minimal error. The longitudinal analysis evaluates continuous data thus avoiding the need to correlate from one time period to another either backward or forward.

Cross-sectional comparative analyses have been used extensively in both qualitative and quantitative studies. A qualitative study is a verbal analysis without the support of numerical data. A quantitative analysis is based on mathematical evaluation of collected data. The most noted of the quantitative studies is that of the Aston Group of 1963 (48). The advantages of this type of

analysis is its focus on one or two independent measures. (37) This enhances the ease with which it is performed and also the accuracy of data collection. There are extensive empirical techniques such as linear regression available to correlate data from one period to another as well as powerful high speed computers to expedite the analysis. Also, the abundance of completed studies of this type can be utilized as control mechanisms.

There are, however, several disadvantages associated with the cross-sectional comparative approach which make it inappropriate for the present study.

First, mathematical models often are inadequate resulting from too few independent variables being examined. The most common example is looking at size without considering the technology employed or era of origin of the organization. Critical variables are either assumed away by "controlling" for them in subsequent mathematical analysis or they are overlooked as not being important. In an empirical study, this usually results from limitations on the number of variables which can be handled by the mathematical technique selected.

Second, the changing relationships among measured variables from one time period to the next renders common assumptions of multivariate linearity and normality of

independent measures false. These are basic assumptions necessary for the performance of this type of analysis. However, often these variables are related parabolically or exponentially and hence are non-linear. (37) Thus the underlying premise of this method is questionable which may render findings invalid. In addition, due to the limited number of contingency variables considered, critical measures may not be considered. Thus orthogonality (mutual independence) rarely exists. This becomes more pronounced when several distinct analyses are correlated. The influence of changing relationships is magnified which may distort results until they are no longer valid. These problems occur due to time leads or lags between variables correlated from one period to another which cannot be assessed in this type of analysis.

Finally, researcher detachment from the context of the research in the cross-sectional study precludes the use of anecdotal data derived from close association with the organization. This impedes successful probing of causation and interpretation of the findings. These short comings detract from the appeal of the cross-sectional comparative approach in this thesis, especially since a thorough understanding of NED is desired.

The short comings of the cross-sectional approach are the advantages of the longitudinal approach.(37)

First, it makes the mis-specification of models resulting from considering too few independent variables more difficult since it examines processes. Thus it requires inclusion of variables until a large variance in results is explained.

Second, the time relationships between variables during different stages of organizational development is more obvious. By focusing on continuous and/or periodic data, it does not suffer time leads or lags suffered in the correlation analysis of the cross-sectional study. The changing relationships between measured variables can be observed over time, thereby providing insight into causal direction, the third advantage. Thus, cohesiveness and logical consistency of results is achieved.

Finally, the nature of the research, especially in the data gathering with the organization, entails becoming genuinely familar with the organization under study. This enables development of a broad knowledge about the organization's environment, personnel and informal procedures. This facilitates understanding of critical events thereby distinguishing between cause and coincidence. (24, 26 & 37)

There are several drawbacks to the longitudinal study

which threaten its validity. As Ivancevich (24) has pointed out, these disadvantages are attributable to the research methodology more than theory.

First, achievement of theoretical results in a longitudinal study requires an extended period of time when compared to a cross-sectional study. Often, the study techniques employed at commencement of an empirical longitudinal study are out of date at its completion due to innovations by other researchers during the course of the longitudinal study. This can lead to questionable findings if the method employed has been found to be inaccurate or inappropriate.

Second, retaining a representative sample over the course of the study for several years is difficult. This is especially evident when data is gathered through questionnaire surveys.

Third, the selection of periods for study is difficult. In addition, if the organization's environment changes radically during the study, these problems can render the findings useless.

Lastly, the researcher can easily become overwhelmed with data as well as the presence of numerous observed multiple causalities. This can result in an exceedingly

complex picture not readily lending itself to simplification, thereby inserting subjectivity into the analysis. (24) This last point has been a major stumbling block to the wide-spread application of longitudinal analyses to organizational research. The problems of variable identification, time varying directionality, and multiple causation have precluded the simplified analysis so readily accomplished in cross-sectional studies.

As Miller and Friesen (37) point out, in selecting the longitudinal approach the researcher is faced with a series of trade-offs which specify the precise nature and scope of analysis. The number of variables to consider. The sample size or number of organizations to study. Lastly, whether or not to use quantification in the identification of five distinct types of longitudinal studies shown in figure 1.

In order to capitalize upon the abundance of data at NED, this necessitated focus on a qualitative study. A complete quantitative approach clearly would require several years in model formulation and verification prior to implementation. Thus it was decided to supplement a qualitative longitudinal analysis with minimum empirical assessment of data. Analyses of both multiple organizations and a single organization analysis were considered. Since the study was intended to analyze

	Type 1	Type 2	Type 3	Type 4	Type 5
Features	Anecdotal (broad scope) Single Organization Non-quantitative	Multivariate (broad scope) Single Organization Quantitative	Narrow Scope Multi-Org'n. Quantitative	Multivariate (broad scope) Multi-Org'n. Non-quantitative	Multivariate (broad scope) Multi-Org'n. Quantitative
Advantages	Full and deep insights into organizational change & development	Excellent explanatory power--both statistically and descriptively	Fine account of how variables change over time	Focus on critical aspects of organizational behavior	Replicable
	Ability to infer causality	Very rigorous and replicable	Replicable	Much detailed info. used to justify conclusions	High (or well defined) generality
	Ability to identify critical variables	Broad picture of org. functioning	Reasonable generality	Non-simplistic accounts	Rich, multivariate descriptions help combat specification error
	Occasional basis for new theory and hypotheses	Lowest chance of specification error	Causal insights	Good for generating hypotheses and theories	Good for testing hypotheses
			Ease of data gathering		
Limitations	Poor generality	Poor generality	Specification error	Small samples make generalizations difficult	Limitations vary somewhat among the studies
	Non-cumulative	Limited potential applicability	Narrow perspective of organizational functioning	Hazards of purely intuitive interpretations of data; problems of reliability & replicability	Less explanatory power than for Type 3
	Hard to replicate	Non-cumulative	Findings too general to aid in prescription	Results of different studies may be hard to synthesize because of differences in focus	Data too crude for time series analysis
	Often not very analytical		Few new hypotheses generated		Where org'l. types are not distinguished there may be a problem of overgeneralization
Representative Studies	Pettigrew (48)	Hall(15)	Starbuck(56)	Starbuck et al.(58)	Dewar & Hage(8)
	Mintzberg & Waters(44)	Cyert et al.(7)	Chester(5)	Chandler(2)	Miller & Friesen(39)

FIGURE 1: TYPES OF LONGITUDINAL STUDIES, (MILLER AND FRIESEN p. 1022)

processes the type 1 analysis was selected.

1.2.2. Types of Longitudinal Studies.

A type 1 analysis is a broadly focused non-quantitative study of a single organization. (See figure 1) Its main strength is in providing real insights into how the organization makes decisions, adapts to its environment, enacts a new environment, and restructures itself. Hence the researcher sees why things happen through a rich account of processes showing dynamic interrelationships among many of the attributes of the firm and its setting. Thus it helps to identify critical variables. Its non-quantitative nature as well as focus on one organization limit the generality of results.

A type 2 analysis is an empirical multivariate study of a single organization. The strength of this approach is in its rigorous broad picture of an organization based upon analytical results. It quantifies schemas of dynamic processes thereby combating simplistic perspectives of weak relationships among abstract variables typical of the type 1 analysis which is more susceptible to researcher subjectivity. However, it is difficult to perform requiring extensive investigator ingenuity in modelling the organization. This occurs due to the multi-independent dimensions which must be considered.

A type 3 analysis is a narrowly-focused quantitative study of multiple organizations. It concentrates on specific variables such as size and thus is quite similar to the cross-sectional studies in this respect. Its findings generally are replicable, however it runs the risk of omitting relevant factors.

A type 4 analysis is a multivariate non-quantitative study of multiple organizations. Its strengths are similar to the type 1 analysis. In addition, because it studies several organizations, it provides a more substantive basis for generating new hypotheses and theory. However, due to the sample size, the diversity of results may be hard to synthesize for more universal generality.

A type 5 analysis is a multivariate quantitative study of many organizations. It is the most difficult to perform since it requires extensive resources in the quantification aspect such as organizational records, researchers and computers. In addition, it also incorporates anecdotal data into the analysis. Its main drawback is that it is subject to overgeneralization of results when organizational types are not clearly distinguished.

1.2.3. Institutional versus Survey Data Gathering Techniques.

In gathering data for analysis in a longitudinal study, the researcher is faced with a methodological paradox with two mutually exclusive alternatives: survey or institutional approach.

The survey approach has generally been used in comparative cross-sectional studies by such theorists as Aiken and Hage (1968) and Hall (1963). Recently however, Meyer (1972) successfully used it in his longitudinal study of public financial departments. (55) This technique relies upon questionaire responses of a sampling, known as soft data, aggregated through computerized evaluation to obtain some measures of the organization. Questions often focus on individual perceptions of various organizational attributes such as extent of decentralized decision making. It is often referred to as the indirect method of organizational assessment and is quite suspect because of the subjective nature of the information obtained from respondents' biases and attitudes, as well as the subjective interpretation by the researcher. (45) When applied to longitudinal studies, the problem is compounded by response shifts resulting from respondent changes in reference points when data is collected at distinct

intervals of time. Hence, adjustments for these shifts must be made by the researcher. This inserts more subjectivity into the data analysis further detracting from its validity.

The institutional approach of organizational assessment, known as the direct approach, relies upon information from key informants in structured and/or semi-structured interviews supplemented by data gathered from organizational records such as organizational charts, files and financial records. It is more objective than the survey approach since the reliance on this hard data generates unambiguous information about the organizational structure and its processes. This data is quite reliable, if not obsolete or in error due to informant recall unsubstantiated by documentation (typical of the survey approach). The dependence upon a mix of "hard" data supplemented with interviews, substantially reduces the introduction of researcher subjectivity through interpretation error. (23, 37 & 55)

Each approach, survey or institutional, is applicable and healthy in its own right provided care is taken to account for the inherent weaknesses and subsequent data usage for organizational analysis. Due to the lack of interchangeability of the two approaches as stated by Walton (55), the factors previously presented and the

abundance of historical data at NED, the institutional approach is selected for this study. This will provide the most objective analysis and capitalize on the wealth of information available which will facilitate a comprehensive and productive study.

1.3. Brief History of NED.

Prior to undertaking the rigorous analysis of this thesis, it is necessary and appropriate to acquaint the reader with the New England Division of the Corps of Engineers.

1.3.1. Development of NED.

As Parkman (43) noted in a comprehensive history of NED, New England is the birthplace of the US Army Corps of Engineers. It was here, in 1775, that the Corps received its first military mission during the Revolutionary War. Here too, in 1824, the first civil works projects were undertaken by the Corps when it was entrusted with that mission by the US Congress and the President. Since then, the Corps of Engineers has played an active and important role in the development of New England.

The New England Division was carved out of the North Atlantic Division on 1 May 1942. (43) Prior to that time,

it was composed of districts within the North Atlantic Division. For the first four years of its existence, NED had two districts, one located in Boston and the other in Providence. On October 1st 1946, these districts were consolidated and the New England Division located in Boston became an operating division performing both district and division functions. It remains as such today and has the distinction of being the only operating divisional unit within the continental US. It performs planning, design and construction management of fixed faclilties (investment programs) for the US government. In October 1958, NED relocated from Boston to Murphy Army Hospital in Waltham in order to establish permanent quarters after a history of some movement.

NED is one of eleven engineer divisions managing water resources in the continental US and overseas possessions. (See figure 2) The continental divisions are divided geographically upon water shed boundaries. Thus responsibilities within one state often are divided between two or more divisions. This situation exists in the New England area involving both Massachusetts and Vermont which are divided between NED and the North Atlantic Division. (See figure 3) A similar situation may exist within a division area when further subdivided into districts. Although districts do not exist in NED, they are used in all other divisions. The concept of divisions

DIVISIONS AND DISTRICTS for CIVIL WORKS ACTIVITIES

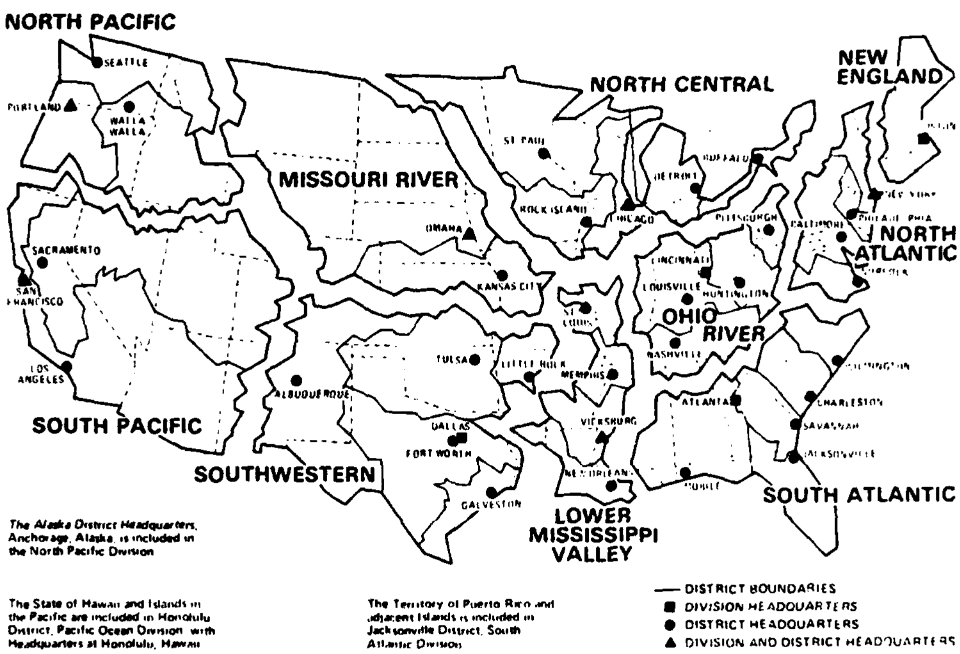


FIGURE 2: CORPS OF ENGINEERS DIVISIONS AND DISTRICTS.

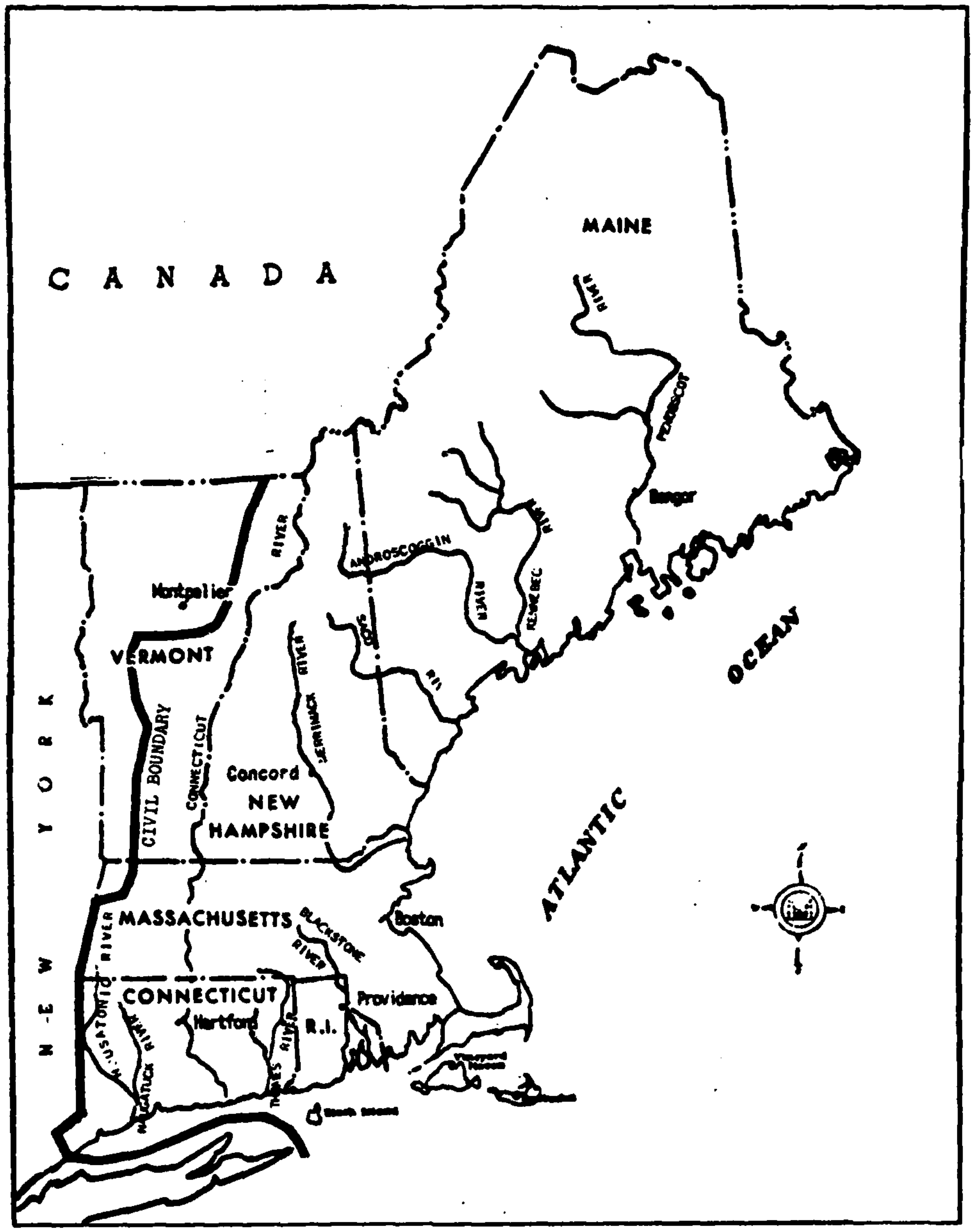


FIGURE 3: GEOGRAPHIC BOUNDARIES OF THE NEW ENGLAND DIVISION.

utilized to supervize districts came into being on 3 December 1888 when the Office of the Chief of Engineers could no longer directly supervize district activities. It has remained a management/supervisory activity since then. All eleven divisions fall under the responsibility of the Office of the Chief of Engineers located in Washington DC.

1.3.2. NED Program Focus.

New England Division services a six-state area: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut. (See figure 3) This area encompasses 66,000 square miles, has a 6,100 mile coastline and serves 12 million people. The activities for which NED is responsible cover a wide spectrum. However, these activities fall into one of three general categories: civil works programs, military programs, or operation and maintenance of completed facilities. Within each of these categories the scope of activities is diverse.

The civil works program in New England is at the present principally concerned with flood control and navigation. Activities encompass studies, project implementation and interaction with other federal agencies. Concerns for flood plain management, basinwide planning and coastal zone management are of prime

importance. These produce programs which often result in navigation, flood control or shore protection construction. In addition, NED is also involved in water quality programs as well as support for EPA Construction Grant Programs. Thus the NED civil works program contributes to the region's well-being in areas such as harbor improvements, industrial and municipal water supply, irrigation, flood damage prevention, recreation, hydroelectric power generation and conservation of natual resources.

The military program was of significant importance to both NED and the region during the period of this study. This will be more fully addressed in chapter 3. Although removed from NED's responsibility in 1971, it is again becoming a major program in 1984. Primarily, it involves Corps management of major military construction programs which enhance our nation's defence. A wide spectrum of projects is undertaken, including troop cantonment/support facilities, airbases, missile facilities, and research facilities for the Army and Air Force. An associated mission is planning for mobilization preparedness in the event of hostilities.

The final category, operation and maintenance of completed facilities, is fast becoming the major mission of NED. It involves operation and maintenance of 31 dams

and 2 hurricane barriers, the Cape Cod Canal and recreation-resource management at these and other sites. Numerous improvement projects are completed on these facilities under this category.

Another important mission of NED is support in disaster relief operations. NED played a critical role in the aftermath of Hurricane Diane in 1955 and the Blizzard of '78.

1.4. Introduction to Contingency Theory.

Organizational theorists used to suggest that there was a "best way" of structuring organizations independent of the environment. On the other hand, Contingency Theory supports the position that there is no best organizational configuration. Each situation is different based on the environmental pulls exerted on the organization. Thus Contingency Theory is concerned with a "best fit" of the organizational configuration with its environment. The more closely the fit, the more effective the work performed by the organization.

The environmental variables affecting the way organizations are structured are known as contingency factors. (2) These factors can be related either to the internal (task) environment such as project complexity, or

related to the external environment independent of the project such as political, social or economic constraints. A more detailed analysis will be presented in chapter 2.

Contingency Theory is a basic and essential assumption for the subsequent analysis of this thesis. It has two components; structure and pulls. It is the basis of identifying and assessing the impact of constraints in the organization's environment which influence change.

1.5. Framework From Contingency Theory.

Theoretical models/frameworks based on Contingency Theory provide a means of organization classification. Mintzberg's framework (41) assesses the direct impact of environmental factors on the organization. In the structuring of the organization, this model evaluates the impact of the environment upon key parts of the organization. These factors exert pulls through reliance upon specific design parameters and functions, which in turn shape both the structural configuration and mechanisms of coordination. Factors such as management strategy serve as mediating elements which filter the environment effects on the organization.

This model allows for hybridization of both structure and process, and thus enables classification within an

arena of possible organization configurations. Within this model, insertion of mediating variables is possible between the organization and its environment with assessment of their impact over time. This will be more fully addressed in section 2.2.2. This model enables analysis of a decay/fit relationship between structure and environment, process and environment, and structure and process. Hence, it enables identification of key variables and mechanisms which facilitate analysis and understanding of the (un)successful adaptation of NED over time.

1.6. Outline of Thesis.

Accomplishing the objectives of this thesis demands a series of sequential steps:

1. Development of the conceptual framework.
2. Identification of program changes and organization periods.
3. Analysis of organization structure and processes.
4. Evaluation of the thesis findings.

The initial step is establishment of a conceptual framework for analysis and classification of the organization under study. This theoretical development analyzes both advantages and disadvantages of various configurations. The framework introduced in section 1.5

and developed in chapter 2 will be utilized throughout the remainder of this thesis to achieve the necessary consistency and precision. In addition, the conceptual model will provide the terminology which will facilitate understanding of the analysis performed thereafter.

The second step is identification of periods of study. In chapter 3 a thorough analysis of organizational finance records enables discretization of the 28 year period into manageable subelements. Initial classification of the organization, and the development of hypotheses regarding structure and mechanisms of activity integration for each period is accomplished.

The third step is the application of this model to analyze and classify the organization of NED over the period under study. Focus is on structural differentiation, mechanisms facilitating and/or impeding the implementation of investment programs. This analysis is undertaken in chapters 4 through 7.

In chapter 4 comparative analysis is conducted on NED on the dimension of organizational structuring. This is accomplished by identification of baseline organization configurations from historical files. Analysis of structural adaptation during each period is performed by

investigating configuration changes at various levels within NED. Then classification of the organization based upon the dimension of differentiation is accomplished for each period.

Chapter 5 investigates the dimension of formal integration of activities in the implementation of investment programs. This is accomplished by analysis of project files within each period to identify the formal liaison devices and means of coordination utilized within NED during each period. An alternative classification of the organization is accomplished for each period.

Chapter 6 investigates the dimension of informal integration of activities in the implementation of investment programs. This analysis relies upon data obtained from extensive interviews with organizational personnel. Hence, this analysis supplements the assessment performed in chapter 5 since it evaluates the informal or "real" liaison devices and mechanisms of coordination utilized during each period. This provides another alternative classification of the organization for each period.

Chapter 7 compares and evaluates the results found in chapters 3 through 6 culminating in an overall classification of the organization based on the dimensions

of differentiation and integration. This will determine the effectiveness and appropriateness of the research approach relying upon program records in determining an understanding of the actual differentiation and integration of NED. Chapter 7 concludes with a clear identification of the relevant factors of process and configuration in the adaptation process of NED.

Lastly, chapter 8 will synthesize the findings of this study regarding program implementation in the public sector. In addition, this chapter will close with an assessment of what can be learned from additional studies of NED and other public works organizations.

2. ANALYTICAL FRAMEWORK FOR ORGANIZATIONAL ANALYSIS.

The inherent complexity of the environment encompassing public works organizations quickly dispatches simplistic notions of applying Max Weber's theory on the "best way to organize", or rudimentary analysis using a purely classical (structural) or human relations (behavioral) theoretical approach (see figure 4, adapted from a model by Leavitt). The interdependence among the major departments of a public works organization indicates that it operates in an extremely open system subject to numerous, competing requirements. This establishes a need for a multi-level approach incorporating the strategies of both the structuralists and the behaviorists. (54) These multiple demands act as forces impinging upon the organization exerting pulls to establish an effective configuration by inducing necessary organizational changes. (See figure 5) Hence, the organization is contigent upon these forces.

The purpose of this chapter is to develop an applicable contingency theory for the assessment of public works organizations. This theory provides a set of of configurations to evaluate, categorize and analyze changes. It presents some hypotheses against which the findings of subsequent analyses can be assessed.

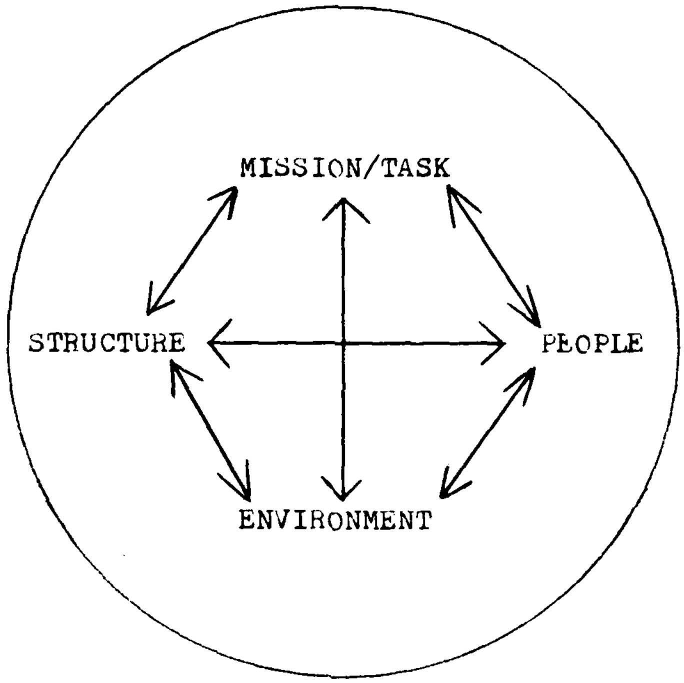


FIGURE 4: ORGANIZATIONAL ENVIRONMENTAL SYSTEM, (TUSHMAN p.2).

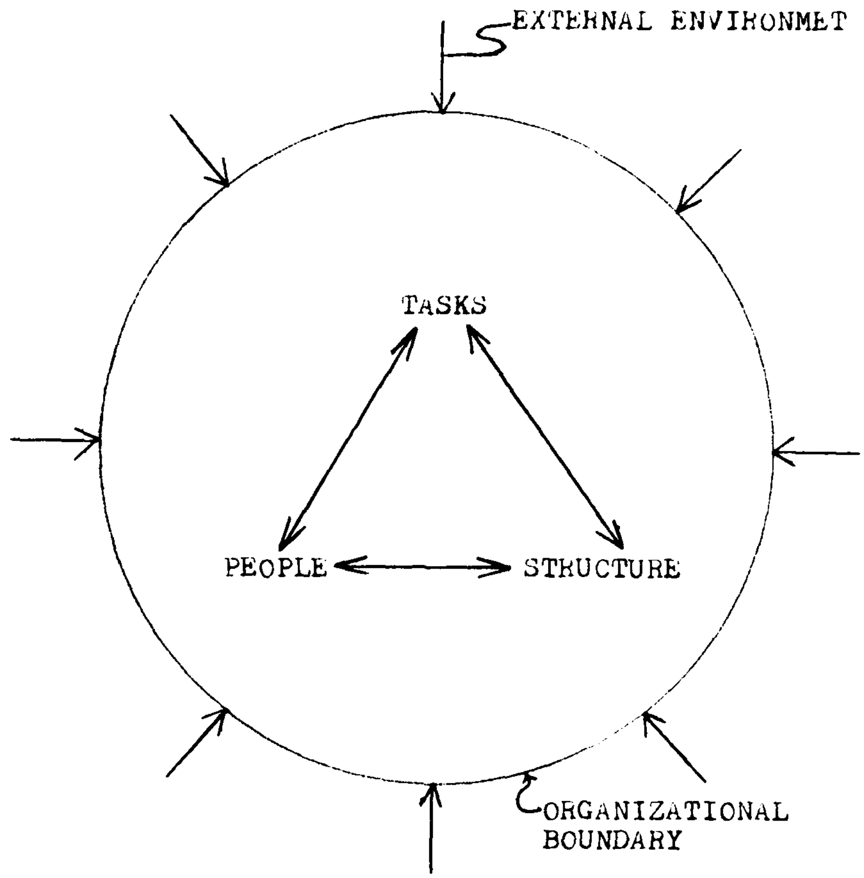


FIGURE 5: ENVIRONMENTAL DEMANDS IMPINGING UPON ORGANIZATIONAL ASSETS.

The synthesis provided by Henry Mintzberg, Bronfman Professor of Management Policy at McGill University, will form the basis of this effort unless specifically referenced otherwise. (41) However, a note is warranted prior to undertaking this task.

The uniqueness of the multiple constituency demands as well as the mediating/buffering factors within public works organizations must be taken into account when applying Mintzberg's framework. It is necessary to modify Mintzberg's general framework to ensure compatability of analysis to public works organizations. The primary value of his framework lies in its comprehensive treatment of literature, as well as its capacity to relate organizational configurations known as variables to contingency factors.(22) The contingency theory to be developed in this chapter will relate the environmental demands (contingency factors) to organizational configurations and integrating devices known as coordination mechanisms. Identification of mediating variables, work/intermediate variables and dependent structural variables will be accomplished. The causation process depicted in figure 6 will be assessed in remaining sections of this chapter.

2.1. Organizational Configurations.

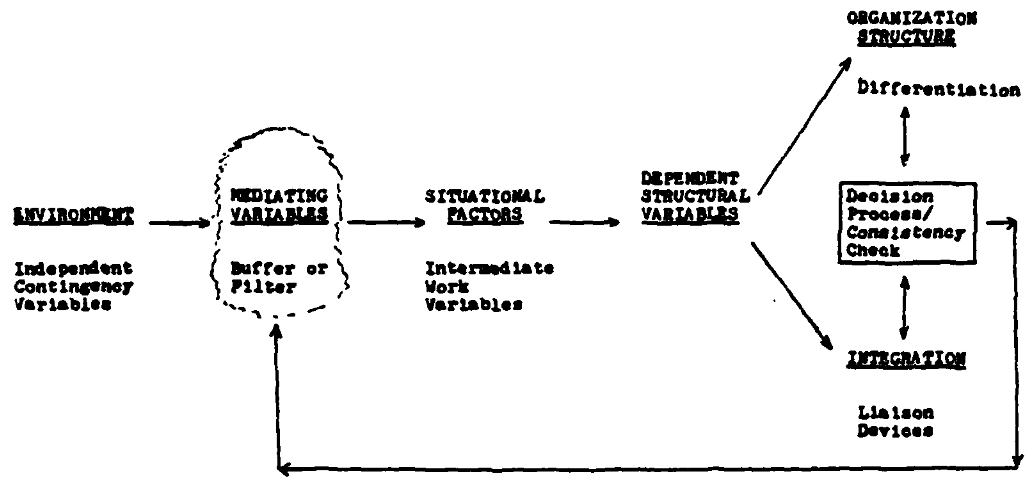


FIGURE 6: MODIFIED CONTINGENCY FRAMEWORK ADAPTED FROM MINTZBERG p. 221.

The Mintzberg framework is shown in figure 7. At each of the points of the pentagon are depicted the five distinct types of pure organizational configurations. Each configuration is characterized by the dominant part of the organization and the coordination mechanism used to achieve integration. The organization is drawn to these poles by pulls exerted by the contingency factors on variables which comprise the organizational make up.

2.1.1. Simple Structure.

The key part of this configuration is the strategic apex. This is the top personnel of the organization charged with ensuring that it performs its mission effectively while concurrently serving the needs of its employees. This entails three sets of duties; direction of policy and overall activity (short term), boundary spanning with the organization's environment by acting as an interface, and organizational strategy development (long term).

In the performance of these duties, the strategic apex exerts a pull for centralization in order to retain control over decision making. This is accomplished by direct supervision whereby one individual takes responsibility for the work of others through issued

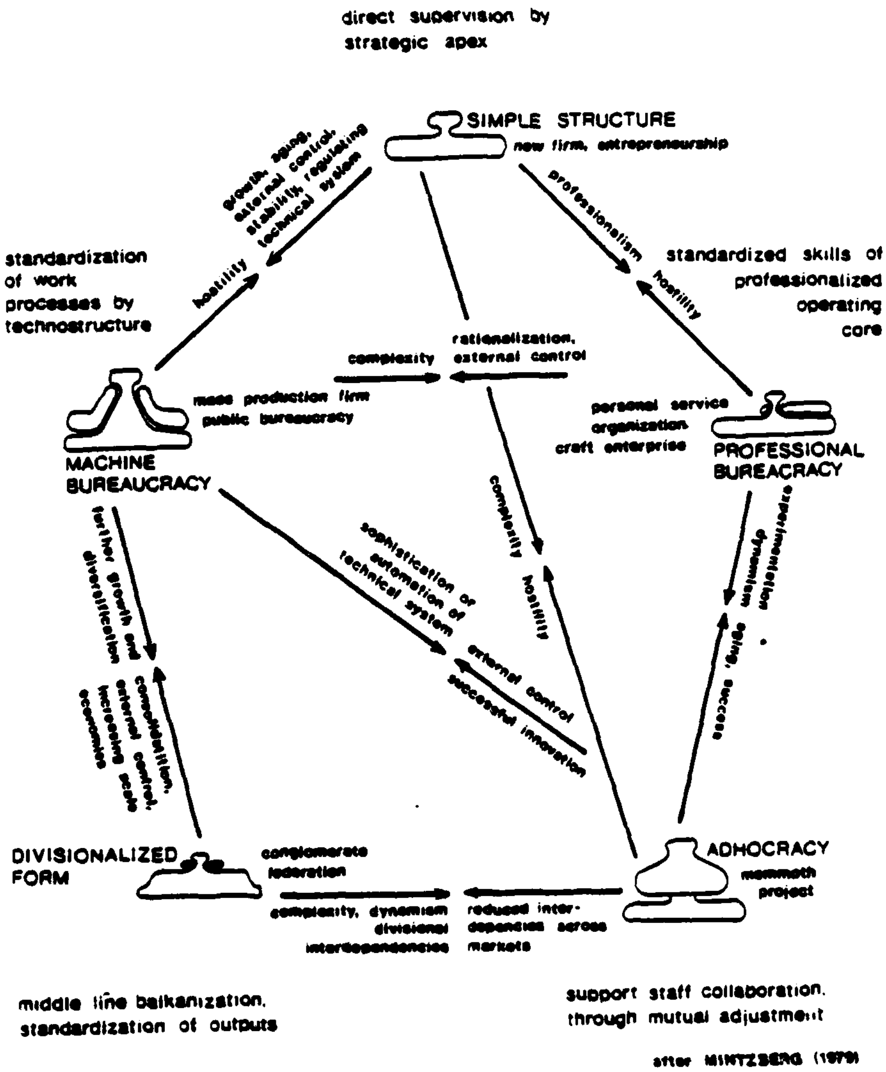


FIGURE 7: MODEL FOR ORGANIZATIONAL ANALYSIS,

(MINTZBERG p. 470).

instructions and subsequent performance monitoring. This type of structural configuration is often found in small entreprenurial firms or employed in organizations faced with a "crisis" where strong leadership is needed.

2.1.2. Machine Bureaucracy.

The key part of this configuration is the technostructure, a staff element charged with analysis and development of the operating works to be performed by the operating core. Their dominance is acheived at the expense of the operators and first line supervisors, and is manifested through their control of the patterns of activity by standardization. They effect this control via behavior formalization and job specialization both vertically and horizontally.

Since their raison d'etre is design and control of standards for work processes, their dominance leads to functionally based grouping of large operating unit sizes with limited horizontal decentralization along functional lines. The classic example of this organizational type is a mass production firm such as a giant automobile company.

2.1.3. Professional Bureaucracy.

This configuration is characterized by the dominance of

the operating core encompassing those members whose work is directly related to the production of goods and services. These operators perform four basic functions; they secure inputs for production, they transfer inputs into outputs, they distribute the outputs, and they provide direct support to the other three functions.

Emphasis is placed on the power of expertise resulting from training and indoctrination from both within and external to the organization such as on the job training or university education. This results in coordination by the standardization of skills with subsequent emphasis on high decentralization in both the vertical and horizontal directions. This is acheived by unit grouping on both a functional and a market basis which provides extensive professional autonomy due to free coordination afforded among peers resulting from vertically enlarged jobs. A good example of this configuration is a university, general hospital or school system.

2.1.4. Divisionalized Form.

The key component of this configuration is the middle line which joins the strategic apex to the operating core over which it has formal authority. Their main function is to act as a communication link intervening in the decision flow between the operating core and the strategic

apex as well as maintaining boundary spanning contacts with other managers, analysts and support staff. As such, they function as a filter in the two way communication flow. Additionally, the middle line manager undertakes the roles of the strategic apex within the context of his own unit rather than the organization as a whole.

Divisionalization occurs as lower level managers seek autonomy by drawing down power from the strategic apex and up from the operating core. This balkanizes the structure splitting it into market based units with limited vertical decentralization. This allowes somewhat independent decision making within the realm of performance controls established by higher headquarters such as profit. Organizational market diversity, separability of the technical systems, age and middle line managerial power needs are situational factors which exert pulls towards this configuration.

Coordination is acheived by the standardization of outputs such as specification of product characteristics or performance standards. However, applicability of this form outside of the private sector is constrained by the lack of adequate performance measures; for example the inability to measure accomplishment of public organizational goals as well as the limitations of autonomy placed on middle line managers by civil service

regulations in selecting subordinates for promotion or job positions.

2.1.5. Adhocracy.

This configuration is characterized by the dominance of the support staff in an administrative adhocracy undertaking tasks on its own behalf, or joining with the operating core in an operating adhocracy undertaking tasks on behalf of a client. The support staff exists to provide support outside of the operating work flow and is different from the technostructure in that its personnel are not primarily advice givers nor concerned with standardization.

The support staff gains dominance through their collaborative efforts in decision making owing to their expertise and knowledge, rather than their autonomous action. This occurs when the organization is structured into work constellations, either functional or market based, thereby establishing an organic structure to which power is selectively decentralized along project matrix lines. These matrix activities are free to coordinate within and between themselves. It is not an efficient structure and is attuned to dealing with the extraordinary or "custom" situations where collaborative effort is necessary to effect performance.

2.1.6. Hybrid Forms.

Within the interior of the pentagon lies the reality or organizational configurations. Known as hybrid configurations, they result from competing pulls causing the organization to exhibit various pure configuration attributes.

2.2. Contingency Factors and the Causality Process.

In Mintzberg's model, causation occurs when four sets of independent variables directly effect differing intermediate work variables resulting in pulls on nine dependent structural variables. (See figure 8) This culminates in an appropriate organizational configuration and accompanying coordination mechanism. This model has proven quite applicable in a comparative analysis of private sector construction firms by Rheinhart in his study of the role of organizational strategy (50), as well as analysis of public works organizational capacity on the Spanish National Railroad (22). However, application of this theory without modification to a study of public works organizations, results in several factors which detract from the dependability of the analysis based on characteristics of the method of the study (refer to chapter 1). In addition, it also results in the inherent

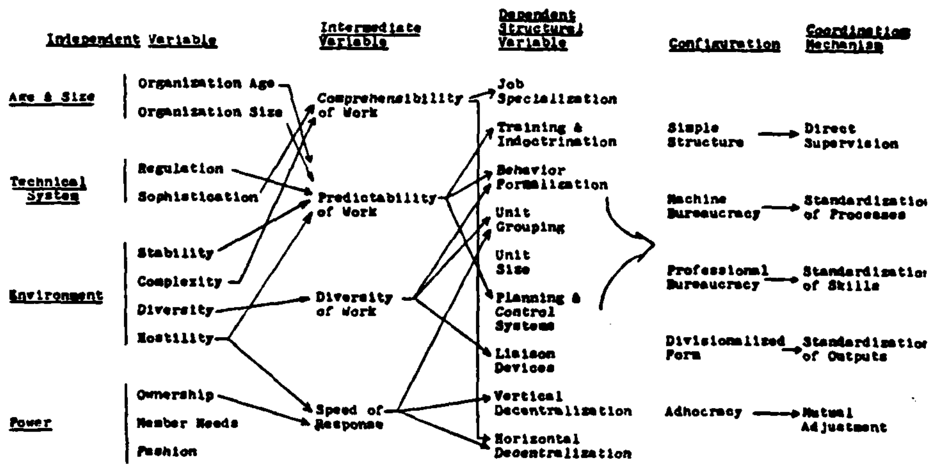


FIGURE 8: PROCESS OF ORGANIZATIONAL ADAPTATION, (MINTZBERG p. 221).

disparities between public agencies and the private sector for which Mintzberg appears to have developed his framework.

The study Lawrence and Lorsch (28) conducted in six organizations (three high performers and three low performers) in three different marketing environments (plastics, food, and container industries) focused on the relationships between organizational states and processes resulting from external environmental factors. They found that organization structural differentiation and integration is directly influenced by external environmental forces.

The longitudinal study conducted by Meyer (33) of 256 public finance departments focused on the relationships between organizations and their environment. Meyer was concerned with direction and ordering of causation. He performed two separate measurements at five year intervals which were used to correlate environmental shifts, organization configuration shifts and organizational changes. Meyer concluded that public finance agencies are extremely open systems to environmental factors due to the high demand by the public for accountability and effectiveness.

The nature of the public works organization is quite

similar to those studied by Lawrence and Lorsch, and Meyer. It is thus hypothesized to be subject to the competing pulls and openness characterized in the studies described above. The work of these theorists indicates that individual expectancy orientations both in an organizational leadership or member role, as well as present organzation characteristics relating to domain, structure and era of formation act as mediating or filter variables between the environment and the organization. Returning to figure 8, a redefinition of the contingency variables as well as an interjection of mediating variables in the model is warranted. This is a result of the factors cited previously regarding the environment in addition to the more prominent and forceful interjection of personnel impetus into the causality process arising from the nature of the Civil Service System when compared to the private sector.

The placement of the liaison devices and coordinating mechanisms by Mintzberg shown in figure 8 is inappropriate for the study of public agencies. Drawing upon the study by Lawrence and Lorsch, the appropriate position for these variables is depicted in figure 6. In this model, the liaison devices are the means to effect coordination influencing both the structural differentiation variables and the integration variables (Mintzberg's coordination mechanisms). This model allows for selection of a

structural configuration and a coordination mechanism independently. These organizational elements must be compatible with the environment as seen from both within and outside the organization to effect the integration required to achieve organizational effectiveness.

2.2.1. Contingency Factors.

Mintzberg's external variables of age, ownership and power will be addressed as mediating variables in section 2.2.2. Mintzberg's independent size variable is more appropriately seen as a dependent structural variable, and will be addressed in section 2.2.4. The remaining four environmental variables (stability, complexity, diversity and hostility), and the two technical variables (regulation and sophistication) defined by Mintzberg remain as the independent set of forces impinging on the organization known as contingency factors. (see figure 8) This set is not complete and requires additional variables. However, prior to fully developing this aspect of the model, it is appropriate to investigate the theoretical basis from which the remaining variables will be extracted.

The research of Lawrence and Lorsch (28) identified three major external environmental demands which acted as stimuli effecting organizational differentiation and

integration. These factors are;

-Science; the continual emergence of scientific knowledge.

-Market; the uncertainty, complexity, diversity and hostility of the market or clientel.

-Technological-Economic; the competitive issues to innovate products and processes.

Although these factors were a result of a study on private sector organizations, when considered in light of the longitudinal study of the public finance agencies by Meyer (33), the similarity of these findings and applicability/incorporability in Mintzberg's model is quite apparent. (See figure 9)

The transition from a "competitive" private sector to a "domain oriented" public sector produces new relationships between the environmental variables. The definitive lack of economically based competition or quasi-market alternatives as well as the lack of impetus for innovation in the public sector is replaced by multi-constituency societal demands arising from diverse and competing interests (political, social or economic) as well as directed program or mission changes. The affects of new scientific knowledge are likewise incorporated into these categories.

Figure 10 depicts the four categories of contingency

Lawrence and Lorsch	Meyer
Technology-Economics (innovation in competition)	Demands (Market) Political Social Economic
Market Certainty	Changes of Mission/Tasks (competition)
Science (new knowledge)	Year of Present Change

FIGURE 9: ENVIRONMENTAL FACTORS NEEDED TO MODIFY MINTZBERG'S FRAMEWORK.

MULTIPLE CONSTITUENCY DEMANDS

Political Sources/Motivation

Social Sources/Motivation

Economic Sources/Motivation

PROGRAM or MISSION

TECHNICAL SYSTEM

Regulation

Sophistication

FASHION

FIGURE 10: CONTINGENCY FACTORS.

factors or independent variables which are incorporated in the organizational model to be developed in this chapter.

Multiple constituency demands are a synthesis of Mintzberg's environmental variables (figure 8), Meyer's market demand variable and Lawrence and Lorsch's market certainty and technology-economic variables (figure 9). These multiple demands arising from political, social and economic considerations are generally independent. However, connectivity can arise which is spurious and time dependent.

The contingency variable of mission or program change is dissimilar from the multiple constituency variable. (See figure 10) The later can effect short or long term mission specific changes, while the former almost always effects long term and more broad organizational changes. It is not a demand but an observed event or lack of product/service which causes the organization to undertake the mission. Thus it is a non-constituency demand. This contingency variable is a synthesis of Lawrence and Lorsch's market uncertainty and science variables, and Meyer's change of mission/task variable.(See figure 9)

The third contingency variable (technical system) is Mintzberg's variable. (See figure 10) It consists of regulation and the degree of formalization as well as the

level of sophistication pertaining to its use by the operating core.

The last contingency variable is fashion. It is a synthesis of Mintzberg's variable and Meyer's variable. (See figures 8 & 9). Fashion pertains to the favored organizational differentiation and integration of the day even when inappropriate. It is "vogue".

All of these exogenous or environmental contingency factors are considered to impinge upon the organization in varying rates and degrees of demand. This occurs due to four competing categories of dynamic, scalable forces which serve to weaken or intensify the demands of the contingency variables on the organization. These categories are;

-Stability	versus	Uncertainty
-Simplicity	versus	Complexity
-Homogeneity	versus	Diversity
-Friendly	versus	Hostile

The first category is concerned with the relative stability or uncertainty of the market demands or tasks to be done. It is the predictability or dynamics of the situation. Simplicity or complexity is concerned with the technical or managerial difficulties involved with the task or mission. A simple task is building a stream bank

erosion wall, while a complex task is a major concrete hydro-electric power dam project. Homogeneity or diversity refers to the range of tasks or programs the organization undertakes. For example focusing on only earthen dams is a homogenous program versus inclusion of airport and highway projects which is more diverse. Friendly or hostile is a characterization of the constituency demands impinging upon the organization.

2.2.2. Mediating Variables.

A major shortcoming of Mintzberg's contingency theory is its lack of definitive identification and assessment of the filtering capacity of the mediating variables in the contingency process. (See figure 6) The studies of Lawrence and Lorsch (28), and Meyer (33) have both revealed the presence of these factors in mediating or filtering the effects of the independent contingency factors on the differentiation and integration of the organization. In Mintzberg's model these factors are incorporated in various places throughout the contingency model such as in the independent variables (era of origin), or in the design parameters (present formality of structure). In some cases, Mintzberg does not clearly address these mediating factors, either individual (behavioral) or structural, except in the discussion of his concepts presented in the development of his model.

For example degree of present formality is incorporated in Mintzberg's discussion of the dependent variables of planning and control systems.(41)

Mintzberg's model will be modified by incorporation of the relevant portions of the works by Lawrence and Lorsch, Meyer, and Tushman. (28, 33 & 54)

Tushman's model (54) focused on the dual strategies of behavioral and structural forces acting as levers on the organization. In his study of a glassware factory, he focused his attention on the causation process of change which required both a separation and integration of the independent and dependent variables in the process. He found that certain variables acted as a buffer or filter in tempering or magnifying the effects of the independent contingency factors which shaped the organization. Coupling this similar finding with those of Lawrence and Lorsch, and Meyer, the mediating variables identified from these three studies can be consolidated into four specific factors comprising the mediating variable grouping. The four elements to be developed for incorporation into the Mintzberg framework are; leadership and member orientations, claims to domain, present formality of the structure, and era of origin. (see figure 11)

The variable of leadership and member orientations is

LEADERSHIP and MEMBER INDIVIDUAL ORIENTATIONS

Goals

Time Frame for Feedback

Interpersonal Relations

Dependence on Higher Authority

Insularity from Higher Authority

CLAIMS TO DOMAIN

FORMALITY of PRESENT STRUCTURE

ERA of ORIGIN

FIGURE 11: MEDIATING FACTORS ADAPTED FROM MEYER, AND LAWRENCE AND LORSCH.

affected by three common elements: goal orientation, time orientation, and interpersonal orientation. (28) These three elements produce a cognitive and emotional orientation among managers and members alike, which can vary between functional units resulting in varying perceptual differentiations within the organization. This may also occur within a specific subunit or section in the organization. Goal orientation is concerned with objectives. It refers to both the organizational and individual member objectives which can either be coincident or competing. Time orientation is concerned with the reference frame for expected feedback in the pursuit of a specific organizational or individual objective. The primary measurement element in this case is time. The orientation is thus short or long term. Interpersonal orientation is the manner in which individuals deal with collegues either in a task based or human relations based manner. This latter category is McGregor's theory X versus theory Y. These three conditions establish the context of the individual's needs or member orientations as a member of the organization.

The method of leadership employed by the managers in the organization in light of these member orientations leads to individual member satisfaction, indifference or dissatisfaction with the organization. This in turn leads to turnover, dependence on higher authority and insularity

from meddling by higher authority in determining the effectiveness of leadership as a mediating factor in the causation process. (33)

The variable of claim to domain is closely aligned with member orientations along functional lines. However, it does cut across functional lines and can be an organization-wide factor depending on the breadth of the impinging environmental factors determining this organizational posture. It is synonymous with defending "ones turf". As such, it is the presently perceived or actual responsibilities which in effect determine the allocation of organizational functions and resources. (28 & 33)

The third element, formality of the structure, refers to the present hierarchical system with all its formal and informal controls, standards and rewards. This structure serves as a quantifiable reference for organization members to assess contingency factors exerting pulls for specific organizational change. It serves as a measuring tool by which comparisons are made of the effects of the unknown change against the status quo. Hence, it often serves as an impediment to change. (25)

The last element, the era of origin, constitutes the residual effects of the fashion which was built into the

organization during its founding. These may rise as factors to resist or moderate environmental demands. This can be reflected in the organizational base, regulations, unwritten codes of conduct or characterizations such as "that's the way we have always done business". It is by convention a resistor to change. (25)

The mediating variables can be considered as a woven, four-layered fabric through which the environment must force its demands. The individual and leadership effects based on needs as well as the status of the leadership must be considered in context with reference frames provided by the present structure, domain claims and era of origin factors. (See figure 11) In comparative analyses the latter is a prominent factor, while in longitudinal analyses the former three factors become the more dominant elements captured in the analytical process.

2.2.3. Intermediate Variables.

Acting as linkages between the mediated contingency variables and the dependent variables is an additional set of factors known as work or intervening variables. Within Mintzberg's model there are four factors which comprise the intermediate variables; comprehensibility of the work, predictability of the work, diversity of the work, and responsiveness. (41)

Comprehensibility of the work is the ease with which work of the organization can be understood. It is most affected by the mediated environmental variables of constituency, programmatic and technical system complexity. As such, it influences intellectual organizational usage, thereby effecting the dependent variable of specialization.

Predictability of the work concerns the extent of prior organizational kowledge about the tasks to be done and the means involved. The mediated variables of stability and hostility of the multiple constituency environment, as well as the degree of regulation of the technical system contribute to it. Since predictability is synonymous with standardization, its greatest influence is on the dependent variables of behavior formalization, planning and control systems, and training and indoctrination. These are all encompassed under the title of formality.

Diversity of the work concerns the variety or scope of tasks an organization performs. The mediated constituency demands and programs directly affect diversity, which in turn influences the dependent variables of organization size, unit grouping and formality.

Speed of responsiveness describes the reaction time

available to the organization to carry out its work. The mediated contingency factors of constituency and fashion determine the level of the total environmental hostility. This in turn directly influences the dependent variables concerned with formalization and unit grouping.

Throughout this section, the discussion has not addressed the effects of these work variables on the integrating mechanisms in the framework shown in figure 6. It should be noted that each intervening variable does have a simultaneous effect on the integrating mechanisms, thus on horizontal centralization/decentralization. However, this will be delayed until the next section where the discussion of these elements will be addressed.

Thus the intervening variables serving as linkages or pivot points in the process are strongly influenced by the mediated contingency factors. These in turn affect the appropriateness of the different organizational design parameters concerned with differentiation as well as the parameters concerned with integration.

2.2.4. Integration Design Parameters and Integration Variables.

The inadequacies of Mintzberg's framework discussed in section 2.2 necessitated the separation of the design

parameters ino two categories; those impinging upon the structural differentiational aspects, and those impinging upon the integration aspects. (See figure 12) These integrational design parameters in turn influence the selection of coordination mechanisms, which are simultaneously manipulated with the structural configuration through a human decision process to obtain a "best fit" with the environment. (Refer to figure 6) These integration variables exert pulls on the organization just as the structural design variables do. This causation process can result in a suboptimal coordination mechanism selection which may be ill-suited for the organizational structural configuration selected and/or ill-suited for the environmental demands placed upon the organization. In addition, this can produce a hybrid configuration identified within the boundaries of Mintzberg's Pentagon. Prior to addressing the five coordination mechanisms shown in figure 13, it is necessary to briefly address the four design parameters affecting these variables; planning and control systems, liaison devices, horizontal and vertical decentralization.

2.2.4.1. Integration Design Parameters.

Planning and control systems deal with the extent a positional output should be standardized. Mintzberg categorizes two kinds of systems; those focusing on

STRUCTURAL DESIGN PARAMETERS (DIFFERENTIATION)

Job Specialization

Behavior Formalization

Training and Indoctrination

Grouping (Levels: number, supervision and responsibility)

Size

INTEGRATIONAL DESIGN PARAMETERS

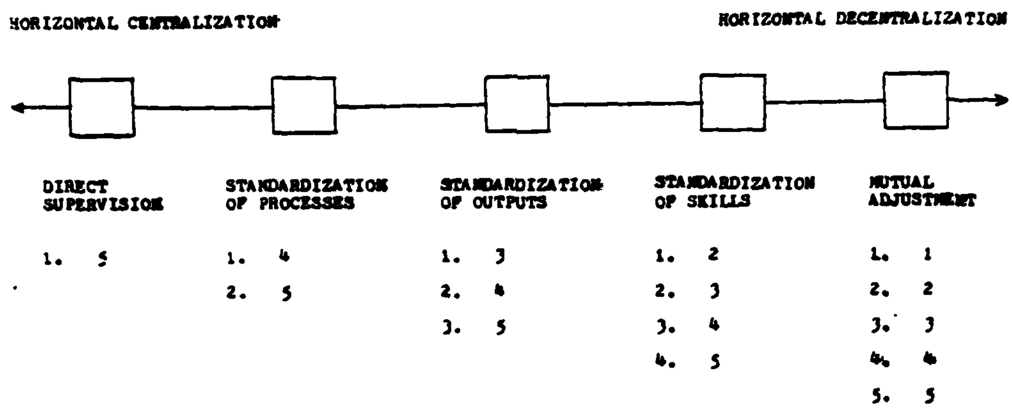
Planning and Control Systems

Vertical Decentralization

Horizontal Decentralization

Liaison Devices

FIGURE 12: DESIGN PARAMETERS, (MINTZBERG p. 67).



<u>LIAISON DEVICES</u>

1. Direct Managerial Contacts/interfaces
2. Temporary or Permanent Crossfunctional Teams
3. Integrating Departments
4. Managerial Hierarchy
5. Paper System

FIGURE 13: INTEGRATION MECHANISMS AND ASSOCIATED LIAISON DEVICES, (MINTZBERG p. 198).

regulation of overall performance (performance control) and those regulating specific actions (action planning). The former is applicable to market based units, while the latter is concerned with specific actions and is oriented to atypical situations. Thus performance control tends towards centralization of decision making while action planning tends towards decentralized decision making.

The liaison devices utilized in effecting the appropriate coordination mechanisms are fivefold; paper system, managerial hierarchy, direct managerial contact, permanent or temporary cross-functional teams, and integrative departments. (28 & 41) These elements have been superimposed on figure 13 in decending order of importance in the organizational integration scheme below each of the integration mechanisms. It is interesting to note that as the organization moves from left to right in figure 13, the reliance on people and informal communication becomes more dominant and necessary to effectiveness. This necessitates brief discussion of the findings of Lawrence and Lorsch regarding integrator effectiveness. (28)

The integrator must be equidistant or neutral to the parties involved; have influenced based knowledge, experience as well as position; be rewarded/recognized for his efforts by superiors; ensure he considers the

arguments or sides from all involved; be centered at the appropriate level to undertake the conflict; and approach the resolution from either a smoothing over, problem solving or power based approach.

Vertical decentralization and horizontal decentralization are concerned with the decision making systems, and are related to the concepts of administrative division of labor and organizational flows. Centralization is the localization of decision making power/steps in relatively few or even one person. Decentralization is when control over decision making is dispersed among many individuals. Vertical decentralization addresses the issue of formal delegation of authority to lower managers in the chain of command either on a selective (restricted scope) or parallel (total scope) basis. Horizontal decentralization addresses the question of job enlargement or control over ones job. It is usually associated with functional grouping or specialization.

2.2.4.2. Integration Variables.

The integration mechanisms identified by Mintzberg are fivefold; direct supervision, standardization of the work process, standardization of outputs, standardization of skills, and mutual adjustment.

Direct supervision achieves coordination by having one individual assume responsibility for the work of others by issuing instructions to and then monitoring subordinates. The design parameters directly affecting this are performance controls and centralization.

Standardization of work process occurs when the contents of the work are specified by instructions or pre-specified procedures. It is influenced by the design parameters of limited horizontal decentralization and action planning.

Standardization of outputs occurs by specifying end results such as dimensions or performance. This specifies interfaces among the tasks achieving coordination. It is mostly influenced by the design parameters of intensive performance controls, limited vertical decentralization and the use of minimal liaison devices.

Standardization of skills occurs when prerequisite training to perform work is established thereby controlling and coordinating tasks. It is effected by little planning and control, horizontal and vertical decentralization, and substantial use of liaison devices.

Mutual adjustment achieves coordination by the process

of informal communication where the control of work rests in the hands of the doers. It is appropriate for both simple organizations and complicated ones. Hence, it is the most decentralized relying on limited action planning and extensive liaison devices.

In figure 13, one sees that on a continuum at the centralization end is direct supervision and at the decentralization end is mutual adjustment. This establishes the spectrum of horizontal coordination mechanisms utilized to effect integration in "pure" organizational structures.

Concluding this section, it is appropriate to adopt Duncan's procedure and combine several of the previously mentioned terms for ease of analysis. Diversity and complexity will be combined into "complexity", and hostility and predictability will be combined into "stability". This facilitates assessment of the integration variables in a matrix environment by transforming them to a scaleable environment. (See figures 14 & 15) This enables us to identify the relevant impact of the mediated environment on the selection of integration mechanisms in our analysis.

2.2.5. Dependent Variables.

STABILITY

COMPLEXITY	Stable	Dynamic
Complex	Decentralized Bureaucratic (standardization of skills)	Decentralized Organic (mutual adjustment)
Simple	Centralized Bureaucratic (standardization of work processes)	Centralized Organic (direct supervision)

FIGURE 14: MATRIX OF FOUR BASIC ENVIRONMENTS, (MINTZBERG p. 286).

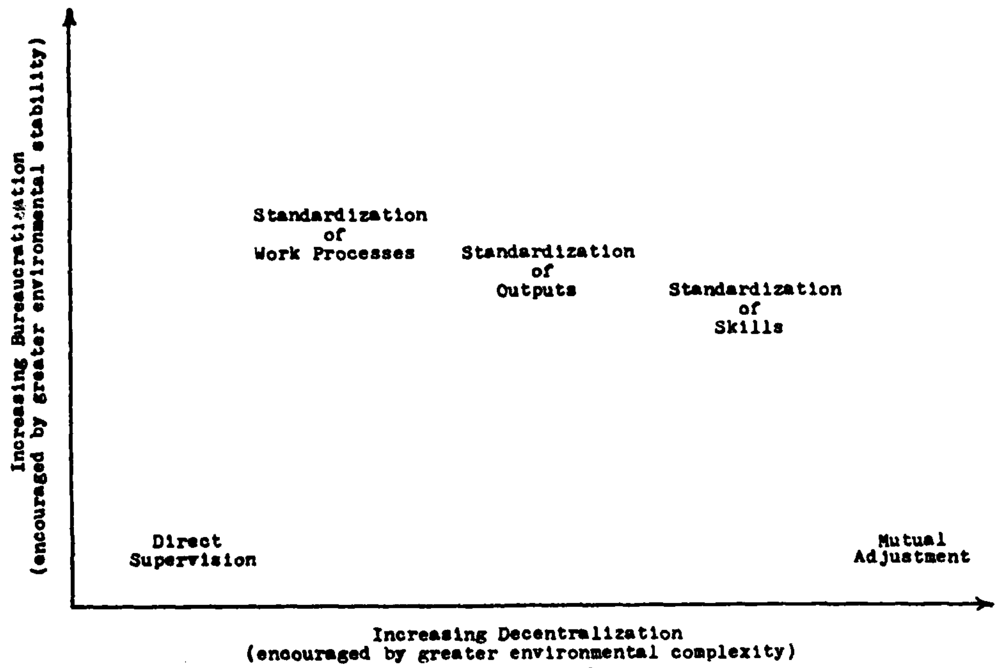


FIGURE 15: COORDINATING MECHANISMS ON SCALES OF ENVIRONMENTAL STABILITY AND COMPLEXITY. (MINTZBERG p. 275).

Through a series of the five remaining design parameters identified by Mintzberg, the structure may be configured to some desired state. (See figure 12) Mintzberg's design parameters are divided into four groups; design of positions, design of the superstructure, design of lateral linkages and design of decision making systems. (41) The latter two of these groupings were analyzed in the previous discussion of the integration variables. The other two design parameters act as structural change agents. In addition, they may act indirectly as catalysts on the integration variables causing a movement towards a specific coordination mechanism. It is the interjection of this dual structure/coordination process where the present framework drastically diverges from Mintzberg's. (See figure 16)

2.2.5.1. Design of Positions.

This grouping deals with the issue of design of positions and contains three related parameters or variables; job specialization, behavior formalization, and training and indoctrination.

Job specialization deals with the basic division of labor and is concerned with two types; horizontal and vertical. The former is concerned with the variety of tasks associated with a position, while the latter is

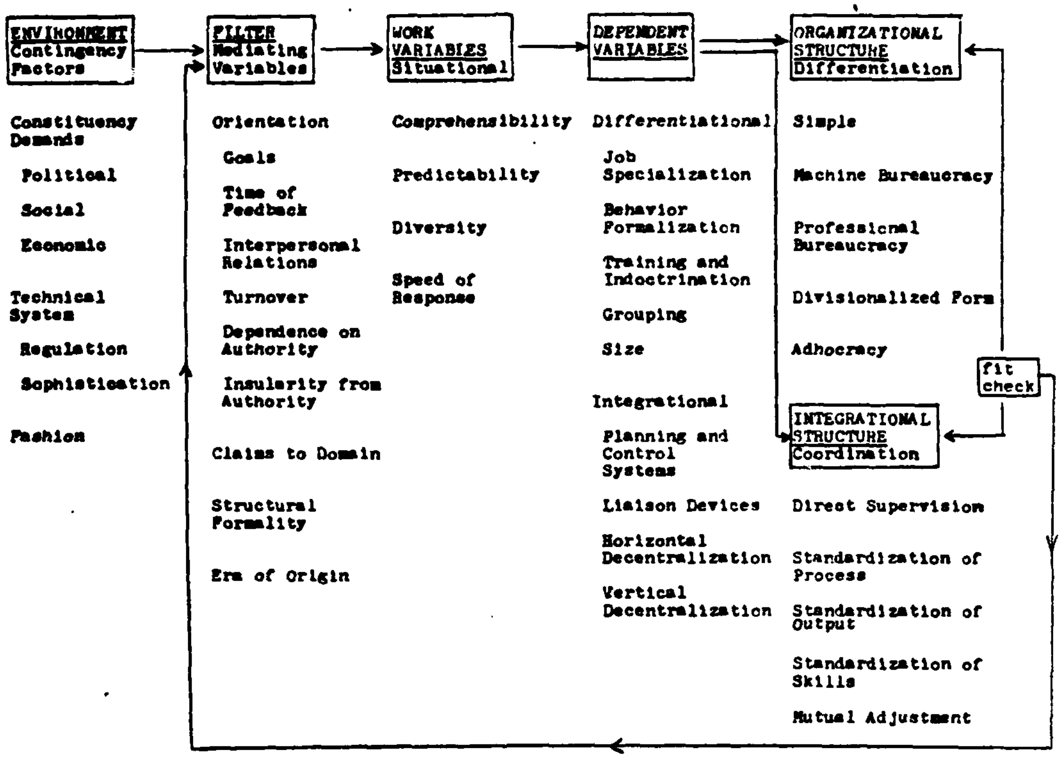


FIGURE 16: ORGANIZATIONAL ADAPTATION MODEL.

concerned with the level of control a worker has over his tasks.

Behavior formalization is concerned with the standardization of work content and a system of regulated flows achieved by one of three means; job specification, specifications attached to the work process, or rules. It is used to reduce variability, to predict it and control it.

Training and indoctrination deals with the standardization of skills and its members to ensure a minimum level of competence.

2.2.5.2. Design of the Superstructure.

The second group of dependent structural design parameters is concerned with design of the superstructure. The two design elements in this group are unit grouping and unit size.

Unit grouping deals with the question of on what basis should positions be grouped into units, how many and what levels. This is generally simplified into either market grouping comprising the bases of output, client or place; or functional grouping comprising the bases of knowledge, skill or function; ie grouping by end product versus the

means. Other relevant factors in this parameter concern degree of responsibility, span of control and supervision.

Size in the present context unlike Mintzberg's definition encompasses organizational size as well as unit sizes. It is concerned with span of control and the method of supervision. Size is directly proportional to the degree of centralization. As one increases, so does the other.

2.3. Causation Interdependency and Organizational Configurations.

It is appropriate to synthesize the framework developed in this chapter and explain the multiple pull process which results in the organizational differentiation and integration referred to as the organizational configuration. (See figures 7 & 16)

2.3.1. Substance of the Mediating Process.

The mediating factors involve the most significant operation in the contingency process. Based upon their relative strengths and weaknesses, the environment is able to filter through and impinge its hostilities, uncertainties, complexities, and diversities upon

organization members. This subsequently affects the structural configuration itself (both differentiation and integration). The mediating variables attempt to buffer the public works organization from its extreme openness to the environment.

The studies by Lawrence and Lorsch (28), and Meyer (33) indicate that if managers possess compatible orientations with regard to goals, time of feedback and interpersonal relations, and are relatively free from turnover, dependence upon higher authority and insulated from it, then the organization is capable of retaining a perceived environment close to the ordinate-abcissa intersection in figure 14. As any of these variables weaken, there is movement towards complexity resulting from the first three orientation factors or towards instability resulting from the last three orientation factors.

Claims to domain, present structural formality and era of origin are factors Kaufman (25) identified as calculated oppositional elements to change, mental blinders and systematic obstacles. They basically serve as poles to maintain status quo. Their relative strengths will also cause movement towards the stable, simple position. However, if they are weakened by removal of the mental blinders through voluntary change or by extemporaneous involuntary change, movement away from the

perceived simple, stable environment is expected.

The relative strengths of the filtering variables can, through their mediation of the environment drive the environmental effects downward and inward on figure 14 resulting in a perception of a more harmonious, desirable set of contingency factors. This could result in a misperception of the true environment which could form the basis of an ill-fitting organizational configuration either from a differential or integrational perspective.

2.3.2. Work Variables and Organizational Configurations.

Once the environment is mediated through to the work variables, it exerts its pulls measurable by the four elements; degree of stability (predictability of work), degree of diversity, degree of hostility, and degree of complexity (comprehensibility of work). This is shown in figure 16. These catagories will be consolidated into two as follows; degree of stability (stability and hostility), and degree of complexity (diversity and complexity).

In relatively simple and unstable environments resulting from hostility or urgency, the organization is pulled upwards towards the apex of the pentagon. (See figure 7) This is characterized by simple structure and direct supervision. There is little reliance on

formalization and decisions are centrally made. (See figures 14 & 15)

As the environment becomes very stable and simple, pulls on the organization are downward to the left of the pentagon towards machine bureaucracy and standardization of outputs. (See figure 7) The lack of hostility and uncertainty as well as homogeneity of simple tasks results in a large organization which is functionally based. Positions are specialized and all necessary liaison is achieved by the managerial hierarchy through a middle level bureaucratic layer. Horizontal decentralization is very limited. (See figures 14 & 15)

If the environment continues to retain its stability, but increases in complexity both in the diversity of tasks and the nature of the tasks, pulls on the organization are downward and to the left of the pentagon. (See figure 7) The organization will attempt to grow by diversifying through market based grouping characteristic of the Divisionalized Form. This is accompanied by coordination through standardization of outputs utilizing integrating departments as well as the managerial hierarchy. (See figures 14 & 15) However, Meyer (33) found this configuration unsuitable outside the private sector. (See section 2.1.4.)

As the environment increases in instability and complexity compared to the Machine Bureaucracy situation, the pulls on the organization are upward and towards the right of the pentagon. (See figure 7) This position is characterized by a fairly stable environment possessing varying degrees of hostility and uncertainty, as well as complexity arising from increasing diversification of tasks and degree of difficulty. The Professional Bureaucracy relies on standardization of skills to coordinate activities and necessitates the use of both formal and informal teams as well as reliance upon integration departments and the managerial hierarchy. Decision making becomes decentralized and grouping can be either functional or market based. (See figures 14 & 15) In Professional Bureaucracies the size tends to decrease relative to a Machine Bureaucracy which is attributable to horizontal job enrichment associated with the shift from a Machine Bureaucracy to a Professional Bureaucracy. (33)

As the environment reaches a stage of high uncertainty and complexity, the organization is pulled downward and to the right of the pentagon characterized by the Adhocratic Structure. (See figure 7) This configuration relies on mutual adjustment utilizing direct manager contact as well as all the other liaison devices to effect integration. This is a highly decentralized configuration at all levels relying on member training to perform its mission. It is

the least bureaucratic. (See figures 13, 14 & 15)

One can see that instability and complexity exert pulls from the upper left of the pentagon to the lower right. (See figure 7) This indicates a movement from centralization and bureaucratization (mechanization) towards decentralized organic configurations. (33 & 41) This movement may be interrupted temporarily by a radical jump toward the top point of the pentagon in isolated hostile/urgent situations.

In reality however, hybridization within the interior of the pentagon usually results in a non-fit of the integration mechanism with the structural configuration due to human decision analysis and selection within the organization. This causes a feedback to the mediating variables initiating an iterative process. The failure of a fit occurs when the environment is ill-perceived by the filtering variables or results from a close fit decaying over time with subsequent refit as enumerated by Meyer. (33)

2.4. Conclusions.

The model developed in this chapter is the analytical framework which will be utilized in chapters 3 through 7 to assess the changes of NED over the period of study. In

chapter 3 it facilitates the development of hypotheses regarding changes in organizational structure and activity coordination. In chapters 4 through 6, it is utilized to investigate the hypotheses generated in chapter 3 along three separate dimensions. Finally, in chapter 7 it provides the framework enabling synthesis of the thesis results culminating in an overall assessment of NED.

3. PROGRAM ANALYSIS UTILIZING FINANCIAL DATA.

The objective of this chapter is to divide and classify the twenty eight year period into smaller periods. This will enable relating program classification to organization classification along the nature of programs during the period of study. This program analysis will be accomplished along several dimensions facilitating identification of homogenous periods. Identification of dominant contingency factors exerting pulls on the organization within each of these periods will be accomplished. These factors will enable classification of the organization utilizing the contingency framework developed in chapter 2.

In addition, this analysis of program data enables the development of hypothesized organization structure (differentiation), methods of coordination (integration) and liaison devices used during each homogenous period. These hypotheses will serve as the stepping stones for more substantive analysis along the dimensions of differentiation (chapter 4), formal integration (chapter 5) and informal integration (chapter 6) relying upon organizational charts, project files, and interviews respectively. A synthesis of these findings will be performed in chapter 7.

3.1. Overview of the Institutional Research Approach.

In order to accomplish the primary objective of this chapter,relevant financial data was obtained from two distinct sources within NED: the Programs Office and the Office of the Comptroller. The data was categorized into somewhat independent periods. This was accomplished with the aid of graphical analysis shown in figures 17 through 21. The periods have been defined as follows:

-Period 1, 1955-1961, Explosive Growth and Prosperity.

-Period 2, 1962-1968, Mission Decline.

-Period 3, 1969-1973, Chaotic Readjustment to Regulatory Imposition.

-Period 4, 1974-1979, Economic Constraints and Adaptation to New Roles.

-Period 5, 1980-1983, Rebuilding.

The beginning and ending of each period was selected to be coincident with the financial report data. Although this may result in a slight error of a year either way, the periods are generally quite realistic.

Evaluation of this financial data had to be accomplished along several dimensions:

-Military Programs versus Civil Works Programs.

-Small Civil Works Projects versus Major Civil Works

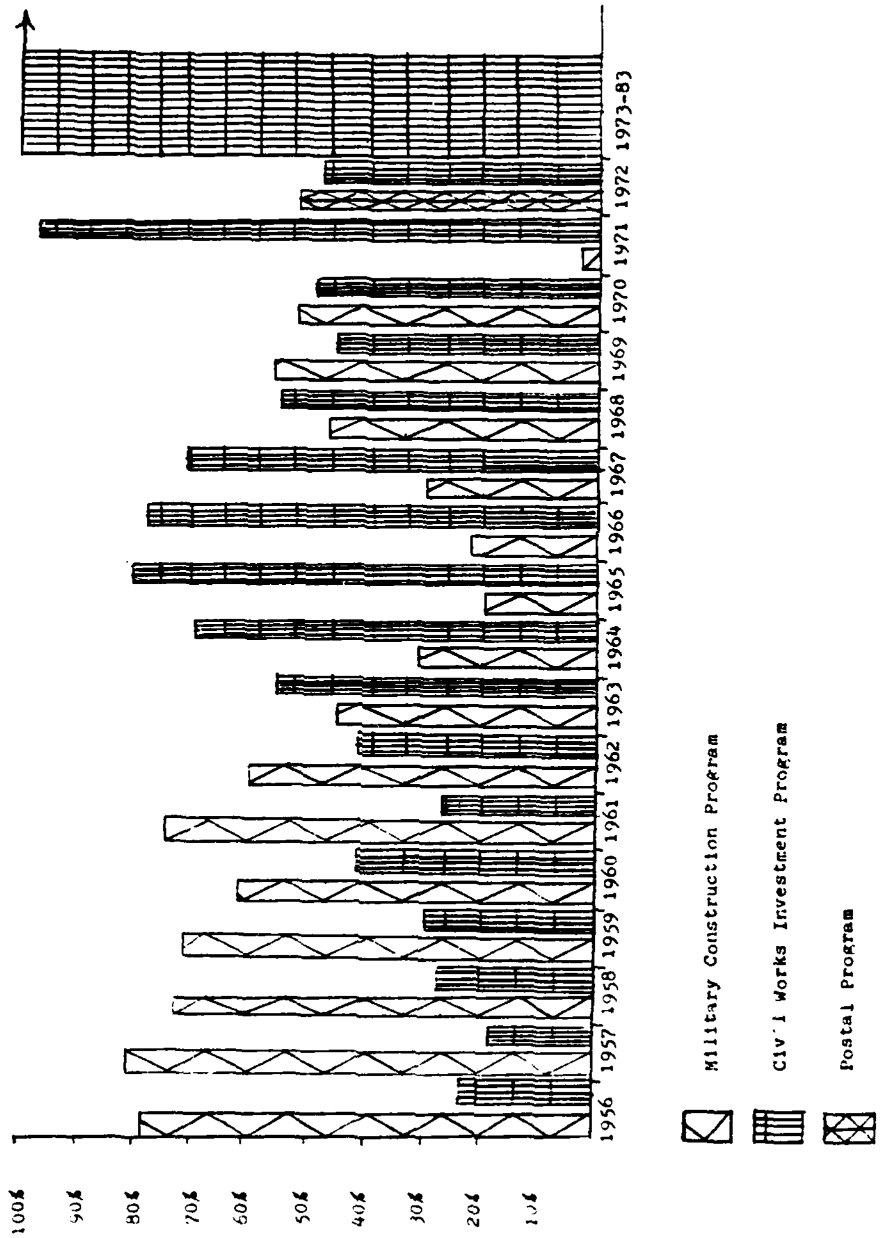


FIGURE 17: ANNUAL EXPENDITURES ON MILITARY CONSTRUCTION AND CIVIL WORKS PROGRAMS.

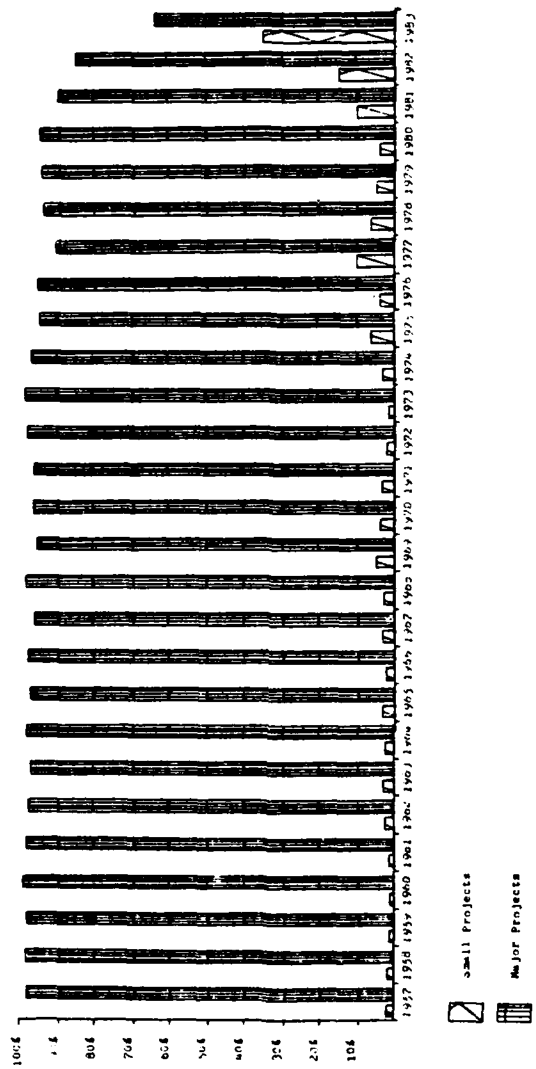


FIGURE 18: ANNUAL EXPENDITURES ON CIVIL WORKS PROGRAMS: MAJOR PROGRAMS AND SMALL PROGRAMS.

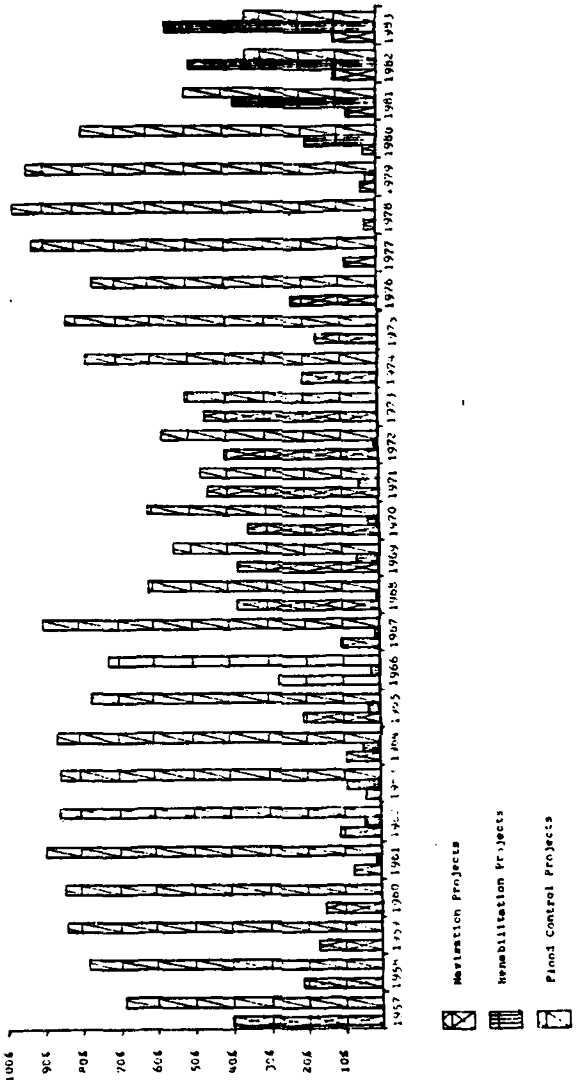


FIGURE 19: ANNUAL CIVIL WORKS EXPENDITURES BY CATEGORY: NAVIGATION, FLOOD CONTROL AND REHABILITATION.

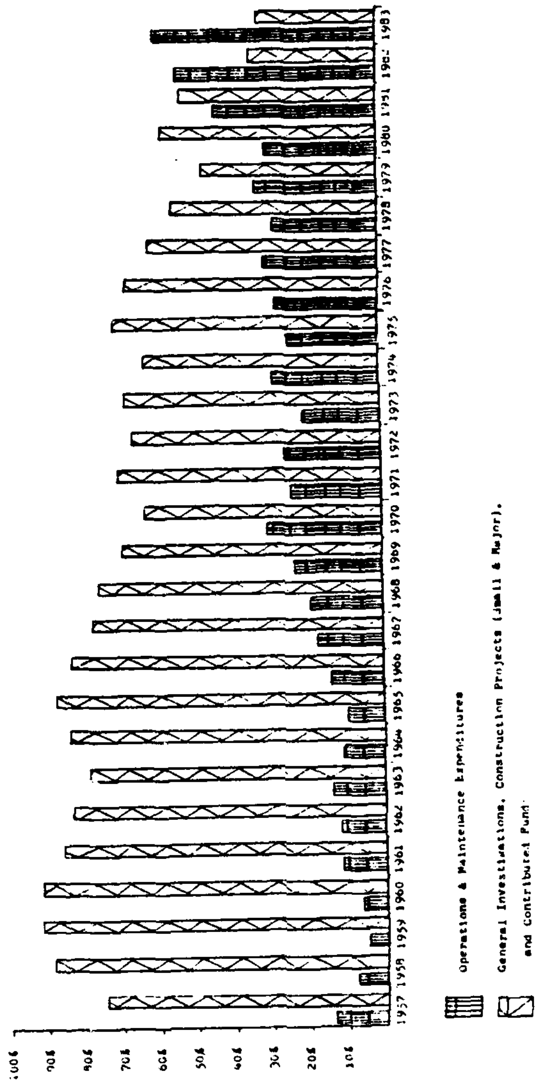


FIGURE 20: ANNUAL EXPENDITURES ON CIVIL WORKS PROGRAMS VERSUS OPERATIONS AND MAINTENANCE.

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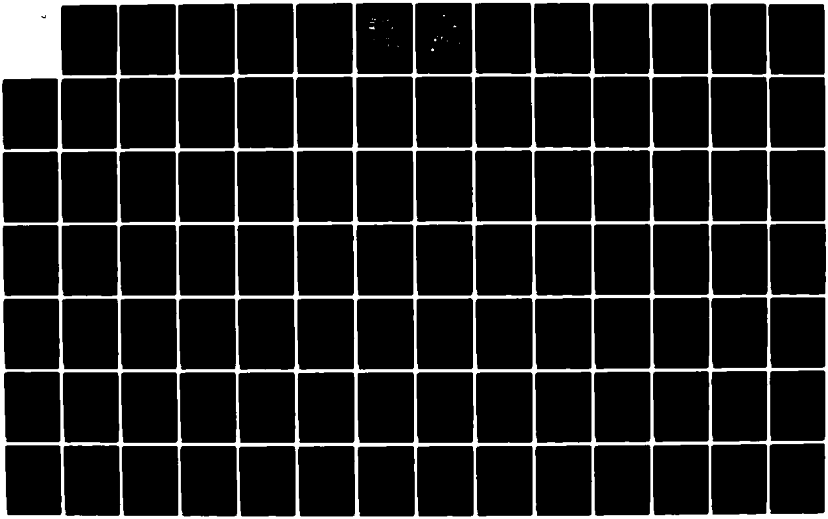

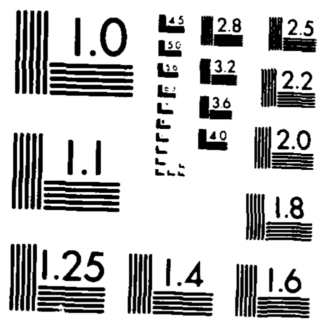

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

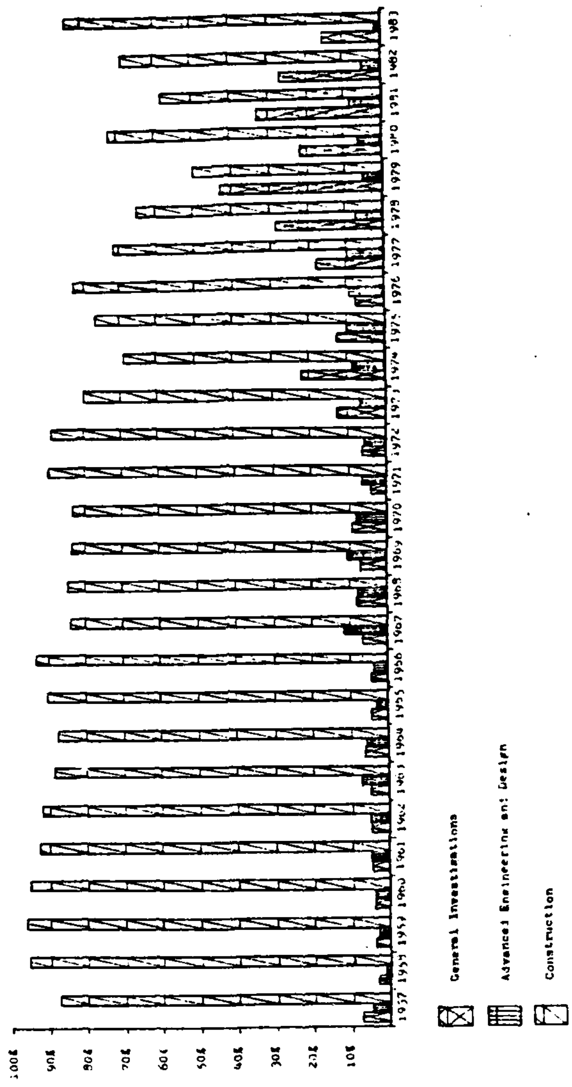

FIGURE 21: ANNUAL EXPENDITURES ON CIVIL WORKS PROGRAMS BY PHASE ON MAJOR PROGRAMS.

Projects.

-Categories of Civil Works Programs (navigation, flood control, beach erosion protection or rehabilitation).

-Phase of Civil Works Project (general investigation, advanced engineering and design, or construction).

-Analysis of Major Civil Works Program Phase Expenditures.

The elements comprising these dimensions will be addressed more fully in section 3.2.

The reader will note that figure 17 runs through 1972 only. After this date, NED no longer had a military construction mission. Also, special programs performed for other federal agencies were considered in the same category as civil works programs although they are really not classified as such by NED. This pertains specifically to the Post Office Program and the Veterans Administration Hospital Program. Failure to consider these programs would seriously alter the results of this chapter.

3.2. NED Program Spectrum.

Prior to undertaking the more rigorous analyses of each period, it is necessary for the reader to have a thorough understanding of the NED program spectrum in addition to that already presented in chapter 1.

3.2.1. Program Flow.

This section will briefly address the flow of civil works programs external to NED. The description and analysis of their flow within the organization will be addressed in the analyses of chapters 4 through 7.

Civil works programs fall into two classifications: major programs or small programs. The delineating factor between these classifications is the total cost of a project. There are three categories which fall into these classifications: navigation, flood control and beach erosion protection. Each has an established upper ceiling mandated by Congress in an annual flood control Act. These Acts delegate authority to the Chief of Engineers to execute a small project if it can be completed within the ceiling mandated by Congress.

There are presently four specific categories of small projects: navigation, beach erosion protection, flood control and emergency embankment protection. For example, section 205 of the 1948 Flood Control Act and subsequent ammendments established a ceiling of $4 million for execution of small flood control projects. Section 14 of the 1946 Act and subsequent ammendments established a ceiling of $250,000 on emergency embankment protection

projects. Similar ceilings were set on the other two categories of small projects, referred to as section 103 and 107 projects.

The initiation of small projects rests with the local constituency. A problem is brought to NED resulting in a study to determine if there is Corps interest and if the benefit/cost ratio is greater than 1.00. If this criteria is met and local assurances are obtained, detailed engineering followed by construction results. There are nine steps involved in the small project process:

1. Initiation of action by local interests.
2. Determination of federal interests by NED.
3. NED conducts a study.
4. NED issues a report to the Office of the Chief of Engineers (OCE).
5. Review and approval by OCE.
6. NED requests project funds from OCE.
7. NED prepares detailed plans.
8. NED accepts closed bids and awards the contract.
9. Construction.

Major programs follow a more complicated procedure depicted in figure 22 and 23. The local constituency enacts the support of their US Congressman/Senator. Upon receipt of congressional authorization to conduct a study, NED initiates a systematic, open to the public process

FIGURE 22: FLOW OF MAJOR PROGRAMS EXTERNAL TO NED.

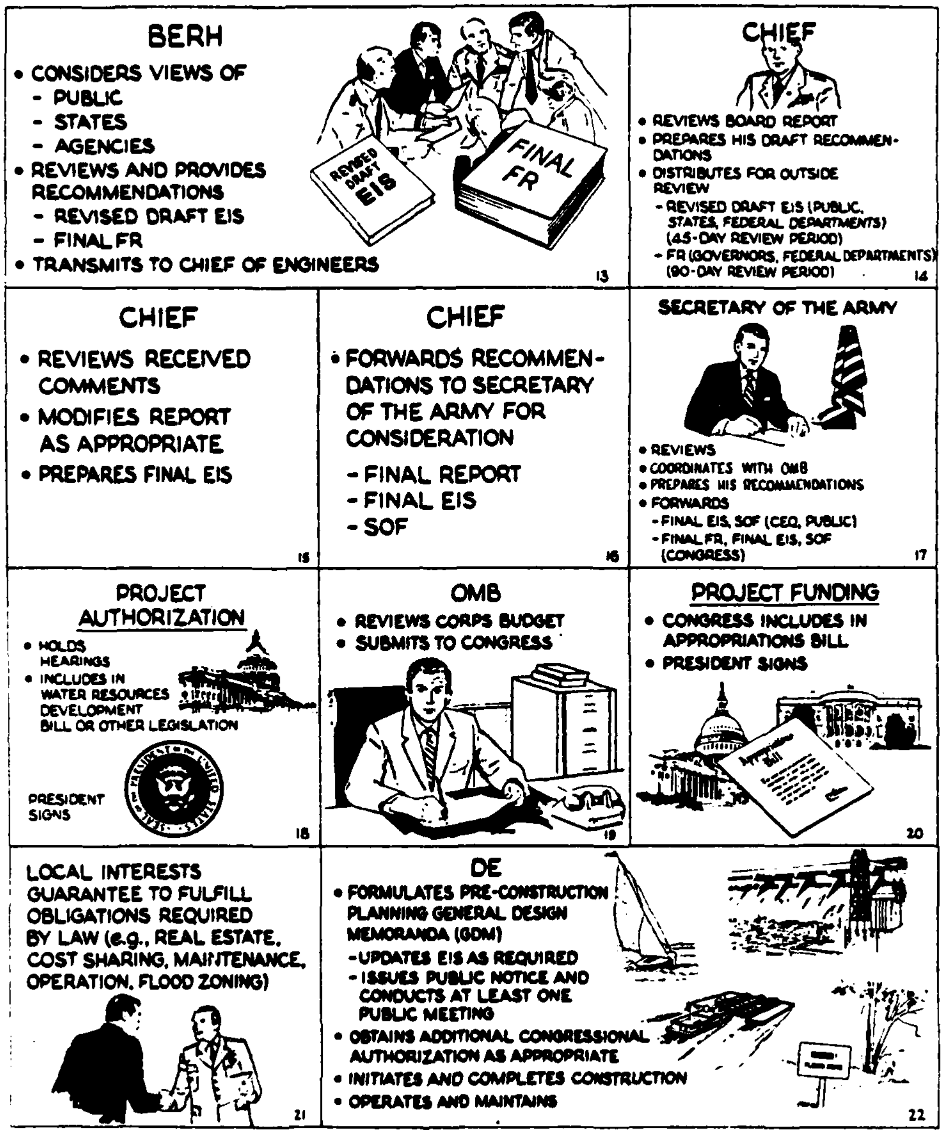

FIGURE 23: FLOW OF MAJOR PROGRAMS EXTERNAL TO NED (CONTINUED).

known as the general investigation or planning phase. Interaction with the local constituency is intense and culminates in a feasibility report if the project meets the benefit/cost ratio. The NED Division Engineer forwards this through the Board of Engineers for Rivers and Harbors (BERH) to the Office of the Chief of Engineers (OCE). These steps constitute the review process.

After final modifications, the Chief of Engineers forwards it to the Secretary of the Army. Coordination with the Office of Management and Budget (OMB) occurs and the project is forwarded to Congress for authorization. OMB then includes the authorized project in the annual budget request which is presented to Congress for approval. At this point the major program is authorized and funded. It is now returned through channels to NED for implementation. If local interests still want it as originally conceived, and they guarantee to fulfill obligations required of them by law such as cost sharing and real estate acquisition, then the project enters the final phases: advanced engineering and design, and construction.

This is a hypothetical process which outlines the flow if there are no problems encountered along the way. Often, several of the intermediate steps have to be repeated in an interative process on most projects. Also,

failure of a program at any step may result in cancellation of the project if the problem areas cannot be resolved by iterative analysis within this process. The major program process thus entails eighteen separate steps:

1. Initiation of action by local constituents.
2. Consultation by US Senator/US Representative with Public Works Committee.
3. Authorization.
4. Assignment and funding of study by OCE.
5. NED conducts the study.
6. NED issues report and public notice.
7. Review by BERH.
8. Preparation and coordination of the proposed report by OCE.
9. Review by the Secretary of the Army.
10. Referral by the Secretary of the Army.
11. Transmittal to Congress.
12. Project authorization by Congress.
13. Project scheduling and reaffirmation of local cooperation.
14. Request for project funds.
15. Appropriation by Congress of project funds.
16. Preparation of detailed plans.
17. Award of the contract by closed bid.
18. Construction.

3.2.2. Program Categorization.

The data presented in figure 17 compares the dimensions of annual expenditures of military funds versus the total budget allocated for special programs and civil works programs. This latter category includes major and minor projects and is also inclusive of pre- and post-authorization expenditures.

A major program is undertaken in two distinct phases. In the first phase, pre-authorization, a feasibility study called general investigation accompanied by some preliminary design is accomplished. In the second phase, post-authorization, a rigorous design and construction program ensues. A small project on the other hand encompasses all aspects of construction from the feasibility study to the completion of the facility.

Figure 18 provides a comparison of the percentage of the total NED Civil Works budget in each of these categories for the period under investigation. The major program category includes both pre- and post-authorization expenditures.

In figure 19, the civil works investment programs undertaken by NED are compared by project type: navigation, flood control, beach erosion protection, and

rehabilitation. Small programs are included in this breakdown as well as pre- and post-authorization expenditures of major programs. The rehabilitation category encompasses special programs such as hurricane studies of the 1950's and 1960's, basin management studies and rehabilitation projects. Since expenditures on beach erosion protection has always been less than 3% of the annual budget, it was not considered critical and hence was not separately graphed.

In figure 20, operations and maintenance has been graphed against the program budget. The latter is inclusive of both pre- and post-authorization expenditures. This total includes contributed funds from local project beneficiaries pursuant to federal cost sharing policies.

The bulk of NED's civil works programs have been major ones, this was considered a critical dimension for separate analysis. Figure 21 depicts the percentage of funds expended annually on each dimension of major civil works programs: general investigation, advanced engineering and design, and construction.

3.3. Explosive Growth and Prosperity, Period 1, (1955-1961).

The major portion of the NED effort during this period was on the military construction program. (See figure 17) The expenditure of 75% of the total NED annual budget at the commencement of the period and 60% at its close on military projects is attributable to the heightened public awareness and political concerns over US retaliatory strike capabilities in the event of nuclear w r. (43) However, figure 17 also indicates that th period is characterized by a 70% increase in the perce age of NED civil works expenditures. This period opened w h 24% of the total NED budget expended on civil works programs and closed with 40%. This is attributable to the declining military mission in the latter stages of this period as the external demands shifted to public welfare programs.

The extensive property damage and loss of life resulting from severe hurricanes of the 1930's, 1954 and 1955 shifted public concern to flood control and hurricane protection programs. Coupled with the prevailing public attitude to get back to a non-wartime life (43), the political and societal environment of this period was characteristically simple and homogenous in its demands, and was of a non-hostile nature. In addition, during this period, the country was undergoing a post World War II economic growth which added to the stability and certainty of the period. (43) This created an environment external to NED which was both demanding of response and willing to

finance necessary programs.

3.3.1. Analysis of Period 1.

Figure 18 indicates that major programs encompassed 98% or more of the annual civil works expenditures. This was accompanied by an emphasis on flood control projects of a local protection nature such as reservoirs and river bank improvements.

Figure 19 indicates that the focus on flood control projects resulted in an increase from 68% of the annual civil works budget to 90% during the period. Additionally, hurricane studies were undertaken consuming up to 14% of this budget annually. Analysis of the major programs reveals that over 92% of the annual budget was spent on the construction phase while the remaining 8% was on general investigation, detailed engineering and design. This is shown in figure 21 and indicates that emphasis was on results and efficient implementation with minimal emphasis on extensive planning.

Due to the relatively few completed projects which were then controlled by NED the annual portion of the budget for operations and maintenance was relatively unimportant, and was less than 10% of the total budget exclussive of military construction. (See figure 20)

Parkman (43) described this period as the most active in NED history. NED reached its peak personnel strength of 1700 and its largest budget of $137 million in fiscal year 1956.

This period can be characterized as one of extremely rapid, almost unmanageable growth. This was accompanied by programmatic shifts towards a production orientation. The environment demanded action which was both efficient and rapid. However, these demands were of a non-hostile nature. They were in fact simple and consistent: execute programs to protect New England from the ravages of future hurricane devastation.

3.3.2. Period 1 Classification.

The simple and stable environmental demands described in sections above suggest movement towards coordination by standardization of the work processes characteristic of a centralized bureaucracy shown in figure 14. The consistent nature of demands for flood control and hurricane protection also suggest organizational structuring along these lines. This would require narrowly based functional operations within the design elements to cope with the extensive volume of programs under these categories. These are characteristic of the

Machine Bureaucracy, a highly bureacratic configuration consistent with a stable environment as shown in figure 15. Thus one would expect horizontal specialization of individual positions was accomplished along functional lines, thereby limiting horizontal decentralization of decision making at the lower levels.

However, diverse geographical program localities across New England suggests the need to enact management on a geographical or market basis oriented to a regional constituency and/or specific grouping of programs. In addition, the program orientation towards both hurricane and flood control projects within NED should produce internally distinct operations which tend to one or the other of those important programs. These factors strongly point towards internal market basing within design elements and field offices. Hence, they suggest marginally strong movement towards standardization of output within each market based operation characteristic of a Divisionalized Form. (See figure 15)

Lastly, the program requirements for technical design increased in the latter stages of the period, especially in the area of hurricane protection where no previous Corps expertise existed. This suggests a strong reliance upon the professional skills of the workers to integrate program activities. Thus one would expect a slight

movement towards Professional Bureaucracy.

Based upon the relative strengths of these competing pulls (see figure 7), the NED organization of period 1 is drawn downward from the apex and to the left of Mintzberg's Pentagon to a position representative of this period as shown in figure 24.

3.4. Mission Decline, Period 2, (1962-1968).

Period 2 commenced with a declining military construction program and a continuation of the explosive civil works program growth initiated in period 1. However, this was to drastically change early within the period. Figure 17 indicates that the civil works investment program in 1965 reached its peak in percentage of the total NED annual budget expended compared to military construction (80% vesus 20%). In 1965, two significant events occured which would drastically alter both the civil works program for the remainder of the period as well as increase the regulatory requirements of future programs.

First, the Water Resource Planning Act of 1965 established Corps interests in water quality. This Act would form the basis of the National Environmental Protection Act of 1969 which would lead to a significant

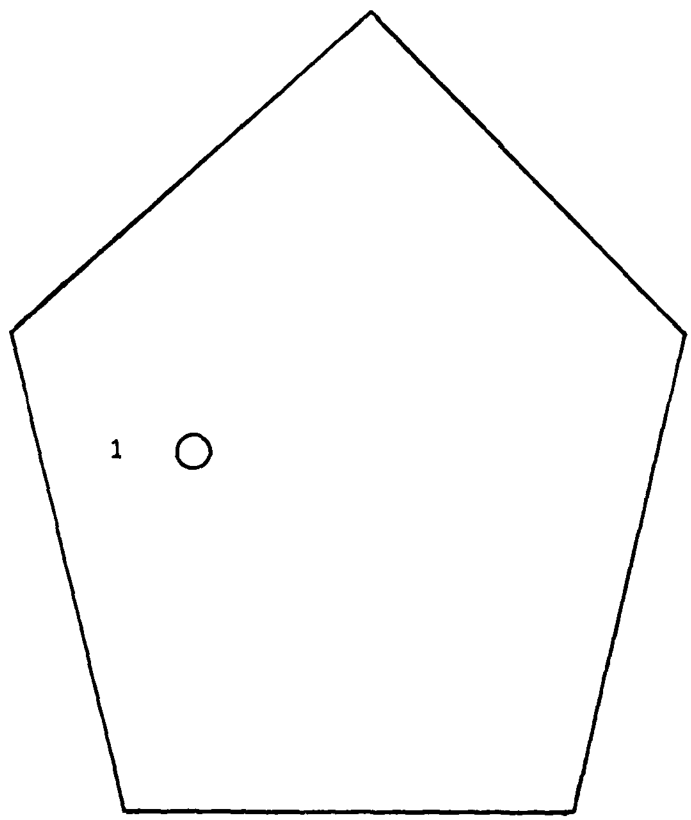

FIGURE 24: PERIOD 1 CLASSIFICATION OF NED BASED UPON ANALYSIS OF PROGRAMS.

and comprehensive regulatory process impacting upon all Corps programs. At this time, it focused NED attention on water resource planning and engineering further diversifying NED activities. This significantly increased program planning which before 1965 was probably an extention of the design element in order to expedite programs during the explosive growth of period 1.

Secondly, in 1965 the NASA lunar landing program rejuvenated the declining military program of NED. As a result, the military program increased in proportion to the civil works program throughout the remainder of the period from 46% to 54% by 1968. (see figure 17)

These two external factors created a more complex and demanding environment which was becoming increasingly complex and diverse in programmatic demands. Navigation programs also increased in importance in the latter stages of this period. These changes in NED focus occured in a period when the NED civil works budget was decreasing from $26.8 million expended in 1962 to $22.2 million in late 1968.

From 1965 onward, the environment became increasingly more complex, uncertain and significantly more hostile in its demands upon NED in comparison to period 1 according to Mintzberg's (41) classification.

3.4.1. Analysis of Period 2.

The NED civil works program entered the period in a position of growing importance relative to the military construction mission. By 1965, it had displaced the military mission to a secondary role which was only reversed by the introduction of the high priority NASA project to land a man on the moon.

Figure 18 indicates that major programs still received over 97% of the annual civil works budget. This resulted in a 1% increase in the small project category over period 1 totals. However, figure 19 reveals a change in emphasis within the civil works program. In period 1, the major emphasis was on flood. In the first three years of period 2, this emphasis continued, which was attributable to the continuation of the peak hurricane protection/flood control construction programs undertaken by NED in the late 1950's. By 1965 however, the focus shifted away from flood protection and by the end of this period in 1968, flood protection programs consumed only 62% of the civil works budget. This was an overall desrease of 23% from the 85% expended in 1962. More significant, however, was the increasing importance of navigation programs.

By 1968, navigation programs had risen from consuming

4% in 1963 to 38% of the annual budget. (See figure 19) Additionally, new work was initiated on previously completed facilities under the category of rehabilitation which was mostly an upgrading of facilities. This latter element was insignificant by itself, consuming only an average of 3% of the expended budget. However, coupling the three categories of programs shown in figure 19 with the high priority NASA program, and comparing them to the relatively stable, simple environment of period 1, one can see that the environment within this period was more dynamic. This resulted in changing priorities within the investment programs as well as more diversity and complexity stemming from the introduction of regulatory actions due to environmental demands. These factors created moderate uncertainty in the constituency demands arising in the environment.

Figure 21 indicates that by 1968 the annual budget expended on the construction phase of programs had decreased from 93% in 1962 to 85%. This was accompanied by a reciprocal increase in program planning reflecting an increase in general investigations, and advanced engineering and design from 4% to 7.6% and 3.7% to 7.3% respectively. This increase in planning and design was mainly attributable to the diversity and complexity of the environmental demands in period 2 compared to those of period 1. However, it also resulted from an increase in

the hostility of the demands in the latter stages of this period. This arose from demands for public accountability and program effectiveness which were omens of event to come in period 3 under the full impact of the National Environmental Protection Act of 1969.

Lastly, figure 20 indicates that the annual budget expended on investment programs compared to operations and maintenance of completed facilities decreased. By 1968, investment programs consumed only 75.5% of the total budget. This is a significant decrease from the 83.7% level of 1962. In the same period, operations and maintenance rose from 12% in 1962 to 19% in 1968. This change in emphasis within the NED mission resulted from requirements to maintain operational control of all completed reservoir and hurricane projects completed under the flood control protection programs of the 1950's. This created a new internal demand on NED resulting in the addition of a major, continually expanding mission. This suggests a shift in organizational structure probably occured.

3.4.2. Period 2 Classification.

The static harmony of period 1 quickly eroded as the external environment diversified and increased in complexity during period 2. This was complicated by

retrenchment of NED within the Corps of Engineers. In 1965, NED was the number 1 of 44 operating districts/divisions in terms of total budget. By 1962, NED was number 8 of 45, and by 1968 number 23 of 44. This period of declining importance indicates one should expect a decrease in operational size accompanied by consolidation of numerous period 1 functional areas within the divisions of NED into more broadly based market type operations. These expected consolidations should result in a further broadening of individual position responsibility accompanied by increasing spans of control over individual work. These factors suggest coordination by standardization of skills of the operating core characteristic of the Professional Bureaucracy.

The broadening of civil works programs during this period as well as increasing demands for public accountability created an external environment which was increasingly complex and diverse. Program funding was still relatively certain, however, toward 1968 public suspicion and mistrust arising from the environmental movement increased hostility of the demands. The increasing complexity and hostility of the environment suggest movement of the organization upwards and to the right of the period 1 position. (See figure 7 & 25) The functional consolidations of period 1 should still exist, thereby retaining the machine bureaucracy characteristics.

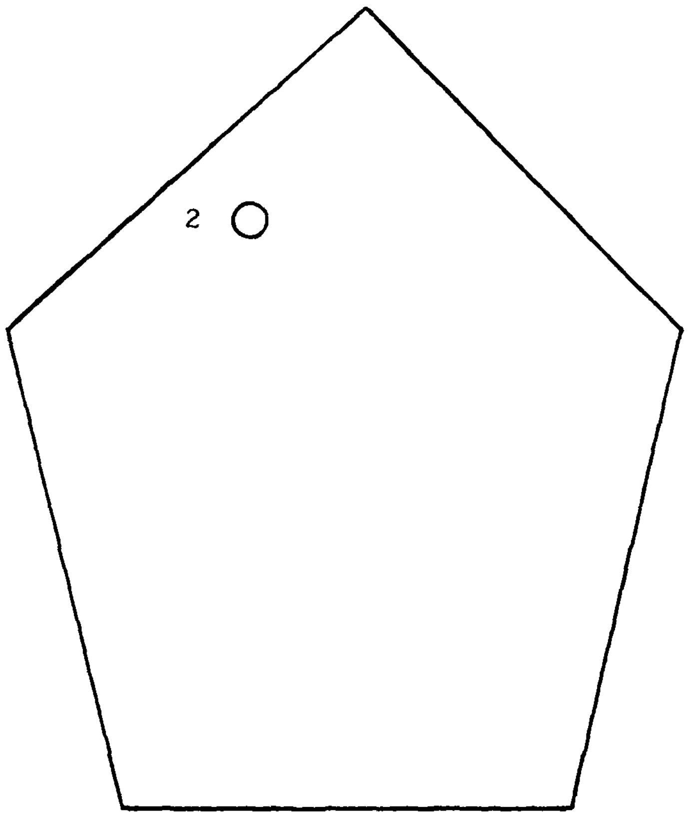

FIGURE 25: PERIOD 2 CLASSIFICATION OF NED BASED UPON ANALYSIS OF PROGRAMS.

However, due to the hostility of the environmental demands one would expect consolidation of decision making upward. This suggests movement towards the Simple Structure with coordination by direct supervision.

Thus one expects competing pulls towards Simple Structure and Machine Bureaucracy occured during this period. This mostlikely was accompanied by an increasing, yet weaker reliance upon worker (engineer) skills. Based on these factors, the organization of this period is classified as a hybrid configuration falling between the Simple Structure and the Machine Bureaucracy position. It is drawn slightly inward due to movement towards the Professional Bureaucracy. (See figure 25)

3.5. Chaotic Readjustment, Period 3, (1969-1973).

The major portion of the NED effort during the first two years of this period was on military construction. (See figure 17) This was attributable to the NASA program. In early 1971, this program culminated and all subsequent military construction programs for the New England region were transfered in 1972 to the New York District Office of the North Atlantic Division of the Corps.

Special programs such as the Postal Program shown in

figure 17 and the Veterans Administration Hospital Program were executed under the purview of NED performing the mission in the capacity as the Federal Engineer for other departments of the U. S. Government.

In 1969, Congress passed the National Environmental Protection Act (NEPA) which established the legal basis requiring the Corps to allow public participation in a comprehensive open planning process. This necessitated numerous public meetings and NED administrative studies on every program regarding environmental concerns to ensure fairness, comprehensiveness and effectiveness. As a result, demands placed upon NED arising from society focused on public *accountability and* program effectiveness. This replaced the previous two periods' demands for project efficiency with moderate effective planning, and speed of response. These new demands imposed serious program delays in NED, typical of Corps wide experience as pointed out by Mazmanian (32) in his study of Corps' response to the NEPA. This act eventually led to a 17 year turn around on programs to increased feasibility planning and design requirements. This also led to inordinate delays and/or shelving of feasibility plans in the pre-authorization phase due to their controversial nature elaborated by special interests groups.

3.5.1. Analysis of Period 3.

Initially, small projects increased in importance. (See figure 18) In 1969, they consumed 4% of the annual civil works budget which was the highest of periods 1 through 3. This trend carried through 1971 probably as a result of the initial regulatory impact of NEPA on communities which desired major program execution.

By pursuing qualified projects under the small projects category, communities were able to circumvent major administrative and regulatory requirements under NEPA, which impacted more intensely on major programs. In this manner, communities obtained project improvements and NED maintained a relatively constant volume of work. This approach to modify program focus due to external factors was necessary because NED was most probably inadequately staffed and organizationally inexperienced to implement NEPA without serious delays in program implementation at this time. This could have severely curtailed NED program operations had the shift to focus on small projects not been instituted.

During the late 1960's and early 1970's several severe winters resulting in extensive property damages due to heavy snow/thaw conditions required major flood control protection. (43) This contributed to the increase in the

small projects category. This demand subsequently declined in the latter portions of this period returning the percentage of major projects versus small projects to pre-NEPA levels of approximately 98%. The majority of these major programs were a result of the implementation of pre-NEPA post-authorizations which were not subject to NEPA regulatory requirements. Hence, they could be executed without reevaluation under the purview of NEPA. This was a major factor in sustaining NED program volume through period 3.

Program diversity within this period was the highest of all five periods. (See figure 19) Flood control programs continually decreased from 63% in 1969 to 51% in 1973 of the annual civil works budget. Navigation programs in turn increased from 35% to 45%. The remainder of the programs was executed under the rehabilitation category which varied annually averaging 2.8%. This swing in priorities was mainly attributable to the effects of NEPA. Major program volume was sustained by the shift to normally lower priority pre-NEPA, post-authorized navigation programs. In addition, increasing public demand for execution of these long overdue navigation programs was timely in nature. Thus the tendency to shift priorities to survive as well as meet a more hostile, demanding society forced NED adjustment culminating in a 'see-saw' program in period 3.

Figure 21 shows a very interesting trend which suggests a shift in organizational priorities. This mostlikely resulted in a reallignment of NED subelement importance in the implementation of civil works programs. In 1969 and 1970, the percentage of the annual civil works budget expended on general investigation increased. This produced a reversal in the expenditures of advanced engineering and design, and construction since all post-NEPA pre-authorization programs had to conform to the more tedious and expensive process. This would increase the length of feasibility studies considerably as shown by the rising costs of general investigations and AE&D. This mostlikely provided a major impetus to reconfigure the structural differentiation within the NED program implementation activities.

In 1971 and 1972, however, the decrease in general investigation expenditures and subsequent increase in the other two categories was attributable to NED adjustment of priorities to execute pre-NEPA programs. (See figure 21) This helped sustain NED design and construction management activities. By 1973, the majority of these pre-NEPA programs available for execution was dwindling. Public demand for new programs coupled with NEPA requirements to increase the expenditures on general investigations to 13%, the highest level to that date. Civil works

investment expenditures on major programs reached a low of 80%.

Operations and maintenance continued to consume larger portions of the civil works budget reaching 26.5% in 1972 with a high of 30.7% in 1970. (See figure 20) This coincided with the major effects of NEPA. NED was becoming a maintenance engineering organization, while focusing its efforts on planning and preliminary design rather than detailed design and construction.

3.5.2. Period 3 Classification.

The increasing complexity and instability of the latter stages of period 2 completely errupted in period 3. The major factors arising in the environment resulted from societal demands for inclusion in the planning process and accountability for resource expenditures. These factors produced an increasingly hostile and quite diverse investment program accompanied by more complex regulatory requirements in program implementation. The recession of 1973 coupled with the energy crisis probably contributed slightly to this uncertain atmosphere. However, their major repercussions on NED programs should be more pronounced in the next period. These factors moved the organization upward towards the right in figure 14 placing it between a decentralized bureaucracy and a centralized

organic structure. The organization was drawn downward and to the right of figure 15 suggesting reliance on the standardization of skills for integration. Thus the organization was pulled towards the Professional Bureaucracy. (See figure 7)

One expects the continued decline of NED programs to reduce the organization size. This should be accompanied by further consolidation of functional areas within program implementation elements into more broadly market based ones. This suggests greater individual position responsibilities. These factors suggest movement towards the Professional Bureaucracy.

However, the hostile nature of the environment and shifting organization priorities suggests coordination by direct supervision. Hence, movement towards the Simp e Structure. Yet, one expects this to be moderated somewhat by a greater reliance upon internal project management in the coordination, expediting and execution of programs compared to previous periods. This occurs due to the increased diversity of programs undertaken in this period, which increased the need for coordination. This would mostlikely be accompanied by an increase in the vertical and horizontal decentralization of decision making within NED. These factors suggest a movement towards coordination by mutual adjustment characteristic of the

Adhocracy with its use of matrix structure. (See figure 7)

Thus, the NED organization for period 3 is drawn downward and to the right of Mintzberg's Pentagon to a hybrid Professional Bureaucracy position shown in figure 26. This suggests coordination routinely was by the professional skills of the operating core, however, direct supervision and mutual adjustment would also be expected. The former to a lesser extent than in the previous period and the latter to a greater extent.

3.6. Economic Constraints and Adaptation to New Roles, Period 4, (1974-1979).

The instabilities and hostilities stemming from NEPA experienced by NED in period 3 were carried over and intensified in period 4. As a result of the recession and fuel crisis of 1973, public outcry for accountability of funding expenditures on civil works programs greatly intensified. Clamor for effectiveness and public participation in programs continued. Congress reached an impass known as the omnibus on civil works appropriations in 1976 which continued throughout the period of study. This meant that the budget request submitted to Congress by the Chief of Engineers for major program authorizations was not approved. Since then, all major programs have been approved by Congress on a case by case basis or as

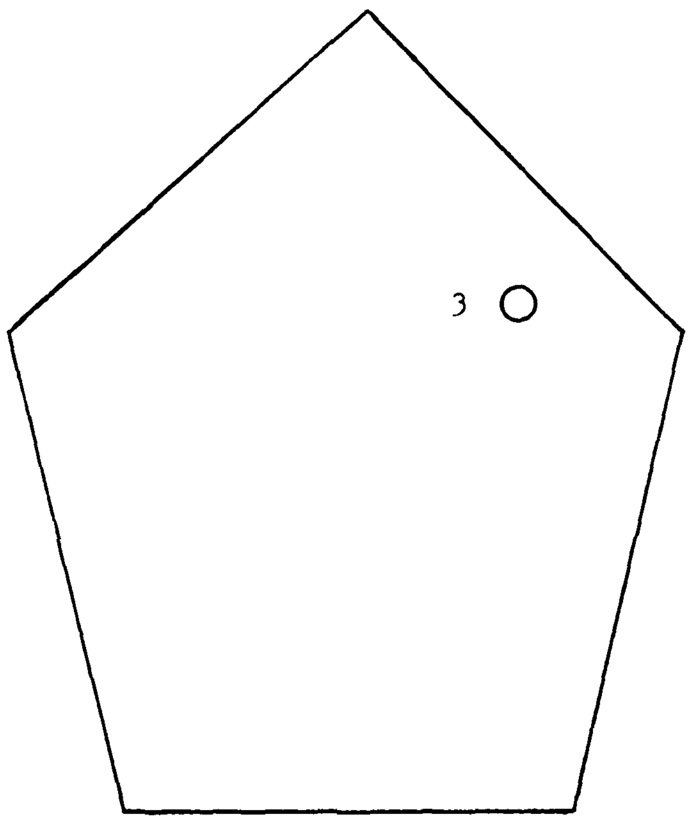

FIGURE 26: PERIOD 3 CLASSIFICATION OF NED BASED UPON ANALYSIS OF PROGRAMS.

riders on other bills. Coupled with the declining supply of pre-NEPA, post-authorization programs this led to a dwindling of major programs in the design and construction phase. The focus had shifted to the pre-authorization phase of major programs which encompassed lengthy, tedious and frustrating public planning as well as more detailed feasibility design. This provided the stimulus for NED to rely more heavily on small programs as well as increase planning and management activities.

3.6.1. Analysis of Period 4.

Small programs increased substantially in percentage of annual budget, rising from 3% in 1974 to 9.8% in 1977. (See figure 18) This significant increase was partly due to NEPA, but was more attributable to the effects of the omnibus bill of 1976. This increase peaked in 1977. The subsequent decrease in importance of small projects from 1977 to 1979 probably resulted from NED adjustment to the uncertainty of the major program appropriations. However, reliance on small projects remained higher in 1978 and 1979 than in all other periods. This suggests further internal reorganization.

The focus of major programs in period 4 returned to flood control projects. (See figure 19) The decrease in navigation programs mostlikely resulted from the rapid

completion of those executed in period 3 which were utilized to sustain NED activities. Subsequent navigation programs in period 4 were post-NEPA and thus had to meet NEPA requirements. This would account for their decline to a position relative to flood control programs consistent with pre-NEPA levels.

Figure 21 indicates a decrease in both advanced engineering and construction during the post-authorization phase. The former decreased from 10% of the annual budget in 1975 to 5% in 1979. The latter decreased from 77% to 50% in the same period. This was accompanied by a sharp rise in general investigations, which now encompassed more substantial detailed design due to NEPA. The increase was from 12% in 1975 to 43% in 1979. Thus, both NEPA and the annual omnibus bills in Congress significantly redirected NED efforts from construction to detailed feasibility planning, thereby curtailing major program execution. NED at this time was no longer the action agency it was in the first two periods. Now it was primarily a planning organization which sometimes executed programs.

Operations and maintenance continued to extract a larger portion of the annual budget. (See figure 20) This increased from 24% in 1975 to 33% in 1979.

Thus, NED was faced with a socio-economic and political

onslaught which redirected internal NED focus as exemplified by annual program expenditures. Major investment programs no longer focused on execution, rather attention was now on proper, effective planning/design. This caused NED reliance on small projects for survival and sustainment in execution capacity.

One of the major program factors sustaining NED in period 4 was the Postal Program which is listed as a special program by NED since it is not truely a civil works investment program. It has been included in this thesis under the category of major programs since it is in fact an investment program, only the client is the federal government not the local populus of New England. Exclusion of it from figure 18 would substantially increase the percentage reliance of NED on small projects.

3.6.2. Period 4 Classification.

The environment of period 4 increased in both uncertainty and complexity in comparison to the previous period according to Mintzberg's (41) classification. Economic constraints arising from the Congressional impass on program funding as well as economically inspired public demands for more accountability significantly added to the uncertainty in the overall NED program scheme. In addition, the intensification of external demands under

the provisions of NEPA inserted a tremendous degree of complexity into program implementation. These political and socio-economic demands pushed the environment of this period to upper right position of figure 14. This is accompanied by a shift towards the far right in figure 15. Thus one would expect a major redistribution of power to ensue resulting from the tremendous shift in environmental demands. This should be accompanied by decentralization of decision making horizontally and vertically, thereby increasing individual position responsibility. Thus one would expect an organization which is characterized by increased utilization of matrix structures in program implementation to coordinate activities. However, there is a competing pull towards Professional Bureaucracy since the immediate impact also served to increase reliance upon worker skills which probably now formed the basis of power assimilation. The combination of all these factors suggest movement downward towards the right hand corner of Mintzberg's Pentagon.

Priorities shifted from design and construction to planning and design. Small projects now filled a major portion of NED effort. One suspects that a major reorganization within NED occured. This would be stimulated by the Corps personnel strength reductions stemming from an overall investment program decline. This would heighten the retrenchment of NED by further reducing

its personnel strength while being required to maintain operational capacity and breadth of program scope. One would expect to see consolidation of functional areas especially in design elements which suggests movement towards reliance on professional skills to effect coordination. However, the complexity of program implementation resulting from NEPA as well as the overall diversity of programs depicted in figures 18 through 21 suggest that reliance would continue to shift to professional skills and matrix structures. The use of cross-functional project team management would be expected to increase substantially. Although reliance upon the individual member skills was of major importance in design and project management, one would expect the new configuration to favor increased reliance upon informal communication characteristic of mutual adjustment as a means of inter-divisional activity integration.

Based upon this analysis, the NED organization of this period is drawn downward from the period 3 position within Mintzberg's Pentagon to that shown in figure 27.

3.7. Program Rebuilding, Period 5 (1980-1983).

The political and social environment still demanded open, participatory planning by NED. However, the fervor under which this was pursued in the early 1970's appears

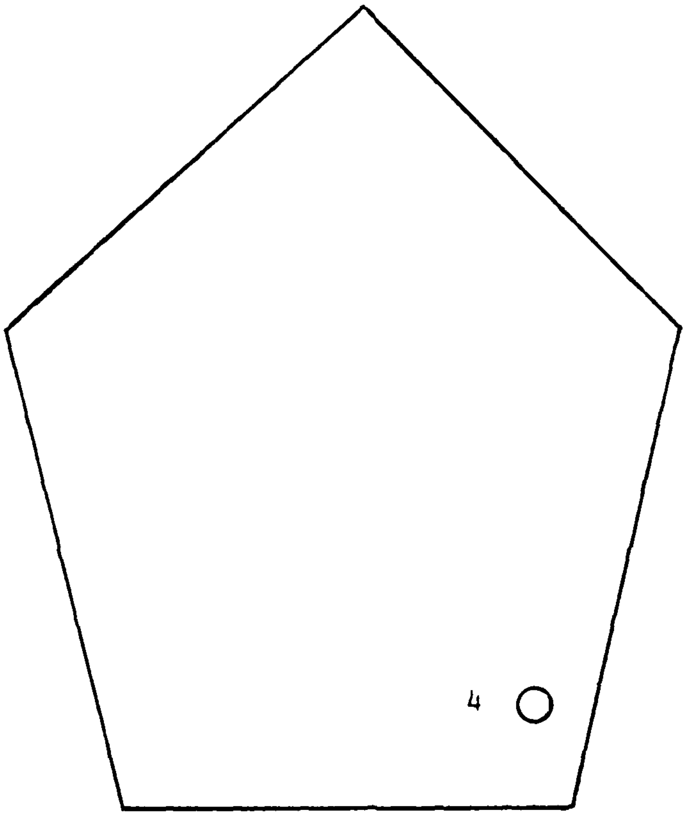

FIGURE 27: PERIOD 4 CLASSIFICATION OF NED BASED UPON ANALYSIS OF PROGRAMS.

to have substantially decreased. This lack of public interest in NED programs may be attributable to the declining NED civil works investment program reflected in the annually decreasing budget: $47.5 million in 1975 to $45.3 million in 1982. Also, this decreased activity by NED may have aroused public concerns that civil works effectiveness had been stymied by too much societal demands.

Although the environment of this period was more stable than period 4, it still was quite uncertain due to the funding problems on major programs and the unpredictable nature of the small project work load. The economic considerations regarding public accountability did remain high. This is reflected in more austerity in the NED budget allocated by Corps Headquarters as well as the continued strength reductions enacted Corps wide such as the 1982 100 personnel strength reduction mandated by the Office of the Chief of Engineers on NED.

Thus, the environment continued to remain very dynamic and relatively unstable.

3.7.1. Analysis of Period 5.

Small projects became significantly important rising to 15% of the annual budget. (See figure 18) The

accompanying decline in major programs was attributable to the depletion of available pre-NEPA programs for implementation, and the lack of Congressional appropriations for six major programs which were at that level for funding in 1983. This caused a major reorientation within NED to sustain capacity by varying its work load. This increased the number of projects per dollar as well as project diversity. This occured because small projects are less expensive, have a shorter schedule window and increase difficulties in resourse allocation regarding work effort.

Emphasis on major flood control programs declined significantly as shown in figure 19. Annual expenditures decreased from 78% in 1980 to 35% in 1982. The major factor in this decline is the completion of the flood control/dam construction initiated back in the 1950's. Remaining flood control programs tend to be undertaken in a local protection nature in the small projects category.

Figure 19 also shows a significant increase in navigation program activity. This arises from the relative ease with which these programs can be undertaken within the provisions of NEPA in comparison to flood control programs. Also the need for port facility upgrade was high during this period. Many harbors around New

England were long overdue for repair/improvement. This need for responsiveness by NED eased the hostility of the demands.

Lastly, figure 19 shows a significant increase in the rehabilitation of previously completed work. This has risen from 3% at the end of period 4 to 50% in 1982. This category does not include maaintenance which is part of operation and maintenance funds.

An analysis of major programs shown in figure 21 reveals that "see saw" activity among the three categories occured in this period. General investigations still remained important averaging 27% of the budget during the period. Advanced engineering and design reflected the trend shown in general investigations. This is attributable to the increase in detailed design encompassed under the continuation of planning and engineering (CP&E) initiated in 1982. This is accomplished in the pre-authorization phase of programs and involves completion of specific design memorandums but does not include drawings and specifications. This should expedite the post-authorization phase of post-NEPA programs but it may also increase the number of shelved design manhours per project.

The percentage of funds expended on construction

decreased annually. (See figure 21) This indicates a decline in program execution and an increase in planning.

Operation and maintenance of completed facilities became the major consumer of the annual budget. (See figure 20) In 1982, it consumed 54% while investment programs consumed only 36% of the budget. The remainder went to other administrative activities.

Figures 18 through 21 indicate that NED was becoming a repair/maintenance engineer organization undertaking a secondary mission of new investment programs. This is a reversal of the organization described in period 1. Retrenchment continues today, and organization priority shifting in an unstable and dynamic environment is an ongoing battle. One would expect significant changes in both organization structure and mechanisms of coordination to be accomplished when comparing period 5 to period 4.

3.7.2. Period 5 Classification.

The environment remained dynamic and decreased slightly in uncertainty with respect to that of period 4. This resulted from several factors: continuation of personnel reductions, declining investment program, declining annual budget coupled with the congessional impass on funding new programs, shift to a maintanace organization, focus more

on planning and an increased reliance on small projects. These factors pulled the organization towards the center top position in figure 14 and upwards towards the left of figure 15 from period 4. This movement favors a hybrid configuration relying upon both standardization of skills and mutual adjustment to effect coordination. This organization tends to decentralize decision both bureaucratically and organically within different subelements.

Figures 18 through 21 suggest that program diversity increased resource scheduling complexity. Reliance upon small projects as well as increased emphasis on planning and maintenance operations indicate that multiple mission/programs operated within the high priority sphere of the organization.

One would expect the mandated personnel cuts of 1982 to result in consolidation of functional activities in the program implementation areas. This should increase individual position responsibility causing movement towards decentralization in the horizontal direction. This is characteristic of the Professional Bureaucracy. However, due to the increasing number of small projects required to sustain NED activities, one would expect a shift at the lower levels to a more cross-funtional type of coordination. This would increase reliance upon mutual

adjustment and project teams. This would establish a project process achieving coordination by a formalized adhocratic standardization of the work process. This causes movement towards the Machine Bureaucracy, hence towards centralization of decision making.

Based on these competing pulls, the period 5 NED organization is characterized as a true hybrid within the Mintzberg Pentagon. (See figure 7) It is drawn upward and slightly to the left of the period 4 position. (See figure 28) One expects the dominant coordination mechanisms are worker skills and the standardization of processes. However, reliance on team resolution of problems based upon professional skills should be significant. Thus, the organization is classified as a Quasi Machine-Professional Bureaucracy which can fluctuate between Adhocracy and Simple Structure quite easily depending upon the situation. It is however more akin to a Machine Bureaucracy even though one surmises its intent is a matrix implementation.

3.8. Conclusions.

The analysis undertaken in this chapter relied upon financial data obtained from institutional sources within NED. This enabled identification of five relatively homogenous periods from the study of program changes. The

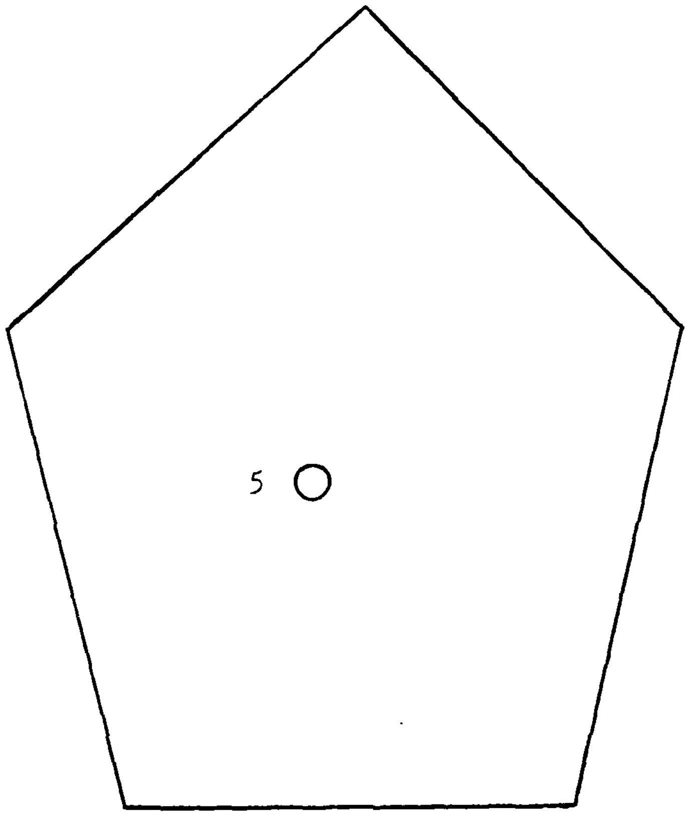

FIGURE 28: PERIOD 5 CLASSIFICATION OF NED BASED UPON ANALYSIS OF PROGRAMS.

theoretical framework was then used to relate program classification to organization classification. Based on an assessment of the environment, the organization of each period was classified. This generated hypotheses of organizational differentiation and integration for each period. These hypotheses require verification through analysis of organizational charts, project files and extensive interviews in chapters 4, 5 and 6.

4. ANALYSIS UTILIZING ORGANIZATION CHARTS.

The objective of this chapter is to classify the organization of each period along the dimension of organizational differentiation. The hypothesized organization structure of chapter 3 will serve as a basis of comparison.

4.1. Methodological Overview.

The semi-annual organization charts are utilized to track the formal structure changes within NED. Baseline configurations for each period are identified which serve as the representative configuration of the period. This facilitates identification of reporting relationships as well as levels of hierarchy within subelements. In addition, it provides some insight into the bases for grouping. This analysis may be used to suggest formal program flow within units but not between units: ie within Engineering Division subelements but not between Engineering and Construction Division.

4.2. Organization Element Responsibilities.

Prior to undertaking the analysis of the five periods, it is important the reader understand the basic subelement

configuration within NED. The configuration utilized to effect this is the February 1983 organizational structure. The data utilized in this section is drawn from the New England Division Engineer Regulation NEDER 10-1-3 dated 1 September 1981.

The New England Division is currently organized into four major elements: the Executive Office, the Advisory and Administrative Staff, the Technical Staff, and Field Offices. (See appendix A)

The Executive Office directs, supervises, and manages the activities of NED staffs and field offices in accomplishment of numerous missions. It draws upon the resources of numerous boards, committees and special assistants to accomplish these tasks.

4.2.1. Advisory and Administrative Staff.

The Advisory and Administrative Staff is comprised of support elements which perform peripheral activities in support of the civil works mission. The majority of these offices, such as the Office of the Comptroller and Public Affairs Office, provide support to the Technical Staff which is directly involved in program implementation.

Some of these Advisory and Administrative Staff offices

do get involved in various phases of program implementation. The Safety Office is an advisory activity for safety engineering to include areas of design, toxic waste disposal and safety in all end use items. It does perform on site inspections which may impact on program implementation during the construction phase. The Office of Counsel provides assistance in contract reviews, real estate acquisition and processing of wage requests for support of design estimates. Lastly, the Programs Office prepares, reviews, analyzes and coordinates civil works program data for budgetary submissions.

4.2.2. Technical Staff.

The Technical Staff is the heart of NED's civil works activities. It is divided into six divisions: Engineering, Planning, Construction, Real Estate, Operations, and Procurement and Supply.

4.2.2.1. Planning Division.

The Planning Division directs and controls general investigations in water and related resource activities. It is the focal element for all programs (small or major) undergoing study in the pre-authorization phase. Hence, it is involved with all activities, both intra- and inter-divisional, in generating feasibility reports. In

order to accomplish these tasks, the Planning Division is divided into five elements: a Policy-Program Unit, Impact Analysis Branch, Plan Formulation Branch, Coastal Development Branch, and Basin Management Branch.

The Policy-Program Unit reviews all reports and policy guidance on diverse water resource development projects, and coordinates programs within the Planning Division relating to funding and resource allocation.

The Basin Management Branch accomplishes comprehensive water resource planning, flood damage and urban water supply studies of New England watersheds.

The Coastal Development Branch plans and develops civil works programs in the areas of general port navigation needs such as deep draft.

The Impact Analysis Branch is responsible for providing guidance and coordination in the areas such as recreation, archaeology, fish and wildlife, and social and economic investigations to other NED elements.

4.2.2.2. Engineering Divisicn.

The Engineering Division is the hub of all program implementation. Its duties are threefold: provide

technical assistance to Planning Division during the pre-authorization phase, produce detailed engineering and design in the post-authorization phase, and provide technical assistance to the Construction Division during the construction phase. It is organized into five branches: Water Control, Design, Project Management, Geotechnical, and NED Materials & Water Quality Laboratory.

The Project Management Branch manages all major projects in the design stage, except navigation and beach erosion control projects. It coordinates all technical and planning functions related to preparation of feature design memoranda, and plans and specifications. It also serves as point of contact for subsequent engineering in the construction phase.

The Water Quality Branch plans and coordinates the design and operation programs pertaining to hydrologic engineering, hydraulic design, reservoir control and water quality engineering.

The NED Materials & Water Quality Lab supports the planning, design, construction, and operations of civil works and military programs.

The Design Branch develops studies, design memoranda,

and final designs for civil works programs. It also reviews designs by architect-engineers (A-E), and shop drawings by contractors, and provides technical engineering support via the Project Management Branch during construction.

The Geotechnical Branch provides geotechnical engineering and geological support for all studies, reports, design memoranda and final designs. It also reviews designs by A-E's and provides technical assistance to other elements.

4.2.2.3. Construction Division.

The Construction Division supervises, inspects and administers reasonable schedules for the drafting of construction contracts for biddability and constructability, and reviews field office activities. It is divided into three branches: Supervision and Inspection, EPA Support, and Contract Administration.

The EPA Support Branch works with the Environmental Protection Agency as the technical arm in contract administration of Superfund Projects with the New England states.

The Contract Administration Branch assists in the

drafting of contracts, provides technical assistance to field offices in the drafting and processing of change orders, and works with the Office of Counsel on the disposition of all contracts and/or claim settlements.

The Supervision and Inspection Branch performs inspections of contract work for compliance with plans and specifications, monitors construction progress and initiates appropriate reports, and acts as an expeditor resolving material, design or change order problems which impact upon project schedules/costs.

4.2.2.4. Real Estate Division.

The Real Estate Division manages the NED real estate program including planning and control, acquisition, appraisal, and management and disposal. It coordinates with officials of federal, state, and local governments, civic groups and private individuals. It approves offers of settlement indirect purchase and condemnation cases. In order to perform the activities in support of NED civil works programs, the Real Estate Division is divided into three branches: Conveyance, Appraisal, and Planning and Control.

4.2.2.5. Procurement and Supply Division.

The Procurement and Supply Division supervises procurement and supply activities, issues and receives bids as well as staffs mistakes in bid and protest of award cases, purchases items less than $10,000 for projects and provides supply support for other NED activities. It is divided into two branches: Procurement which is involved with program activities, and Supply Control and Distribution which is involved with internal support to NED.

4.2.2.6. Operation and Maintenance Division.

The Operations Division plans, develops, directs and controls the operation and maintenance program of NED. In doing this it draws upon the technical resources of the Engineering Division and the project management capablilties of the Construction Division as required. It operates and maintains 32 Corps flood control facilities, 2 hurricane barriers, the Cape Cod Canal and in excess of 180 federal navigation projects. However, the focus of this division's activities do not involve civil works investment programs and any interface it has with other NED elements serves to increase the complexity and diversity of the internal environment surrounding the implementation of investment programs by increasing competition for internal resources.

4.2.2.7. Field Offices.

The Field/Area Offices directly supervise, monitor and coordinate the contractor activities to ensure compliance with contracts, plans, and specifications. They approve completed work for payment much the same as an architect in private industry and are basically NED's man on the ground.

4.2.2.8. General Comments.

The reader now has a general understanding of element responsibilities down to branch level in program implementation within NED. This is a three phase flow:

1. Pre-Authorization: Predominantly under the Planning Division with support from Engineering Division to effect a feasibility study.
2. Post-Authorization Design Phase: Predominantly under Engineering Division with support from Planning, Construction, Real Estate, Counsel, and Supply in effecting design specifications, plans and a bid packett.
3. Post-Authorization Construction Phase: Predominantly under Construction Division with technical support from Engineering and administrative support from Supply, Real Estate, and Counsel.

4.3. Analysis of Period 1 Structure, (1955-1961).

Based on the relatively stable and certain environment, the period 1 structural configuration is hypothesized in section 3.3 to be a Quasi-Machine Bureaucracy consisting of functional groupings in the technical elements based on program flows. One does expect to find geographic grouping within the elements involved in construction implementation. This would draw the organization downward to a Divisionalized Form.

The organization configuration from 1 July 1958 shown in appendix B is the baseline organization of this period.

The organization structure of NED underwent numerous changes in its expansion to cope with the increasing civil works and military programs in period 1. The major changes occurred in the program implementation elements: Engineering Division, Construction Division and the Area Offices.

4.3.1. Engineering Division.

The Military Projects Section of the Engineering Division was reorganized from a functional structure with separate project elements in 1956 to a market based operation along client lines (Air Force Projects, Army

Projects, Special Missile Programs and A-E Contracts). (See appendix B) This facilitated better integration of project requirements within each market but resulted in duplicated effort and personnel within the branch as well as the division. Within this branch one sees a pull towards the Divisionalized Form.

The Planning and Reports Branch of the Engineering Division was reorganized from a program orientation to a functional one in 1956. This was necessary because the shift in civil works programs increased this branch's work load. This activity based configuration increased the flexibility and responsiveness of this branch. The pyramidal nature of the structure depicted by the wide at the bottom functional groupings is representative of the Machine Bureaucracy.

The Design Branch of the Engineering Division retained its functional based orientation throughout the period. Element grouping was strictly along engineering discipline lines. This provided depth of expertise in each disciplne enabling responsive handling of an increasing workload. This resulted in a very wide at the bottom grouping typical of extremely specialized individual job positions in the horizontal direction. This pyramidal structure required a Coordinating Section in order to facilitate program flow and coordination between elements of this

branch. These factors displays movement towards the Machine Bureaucracy.

The organizational structure of the Engineering Division indicates groupings at both the branch and section levels were along functional lines. Branch elements were grouped based on specific activities which are tied to phases of the program process: Planning & Reports Branch to planning phase, and Design Branch to the design and engineering phase. The section elements within these branches are numerous, thus presenting a wide at the bottom appearance. Their grouping was generally based upon engineering discipline resulting in highly specialized job positions. This is very prominent in the Planning & Reports, Design, Survey, and Foundations and Materials Branches. The layered hierarchy of this division indicates there is little horizontal or vertical decentralization of decision making. These factors exert pull towards the Machine Bureaucracy.

4.3.2. Construction Division.

The Construction Division underwent substantial reorganization during period 1. In July 1957, the division was reduced from 387 personnel to 68 personnel when all Field/Area Offices were placed directly under the NED Commander. Although this may not have affected the

actual operations, it placed formal control of the construction sites under the Division Engineer. The branches of the Construction Division were organized along activity lines as shown in appendix B. Although individual position responsibilities were broad compared to those in the Engineering Division, they are relatively specialized in both the horizontal and vertical directions such as construction management engineer and production materials specialist. This configuration is a layered hierarchy exerting pulls towards Machine Bureaucracy.

4.3.3. Area Offices.

By 1958,the Area Offices were reorganized from project lines to geographic bases. (See appendix B) Due to the volume of projects, these Area Offices had to become mini-divisions capable of semi-independent operation to implement programs in the construction phase. This configuration is inclined towards the Divisionalized Form. This classification has a wide at the top configuration which is consistent with the structure of the Area Offices. In addition, the individual positions have less horizontal and vertical specialization than in the Machine Bureaucracy. This is also reflcted in the organization of the Area Offices.

4.3.4. Other Element

The Real Estate Division expanded from 3 to 4 branches. In addition, three branches subdivided into sections. (See appendix B) The Acquisition and Planning & Control Branches grouped these sections based on activities while the Appraisal Branch based them on geographic considerations. These shifts indicate specialization of previous positions and attempts to establish internal flows. These factors display movement towards the Machine Bureaucracy.

The Supply Division increased in personnel by 33% from 49 to 63 by 1961. Although the division's configuration remained constant, there was an increase in individual position specialization resulting from the addition of new personnel. This causes movement to the upper left of Mintzberg's Pentagon.

4.3.5. Conclusions.

The organization is basically a Carbon Copy Bureaucracy characterized by a miniature replica effect in its programs. (See figure 29) It lies almost on top of that hypothesized in chapter 3 between the Machine Bureaucracy and the Divisionalized Form. It is a highly functionalized structure narrow at the top and wide at the base. This is especially evident in the Engineering

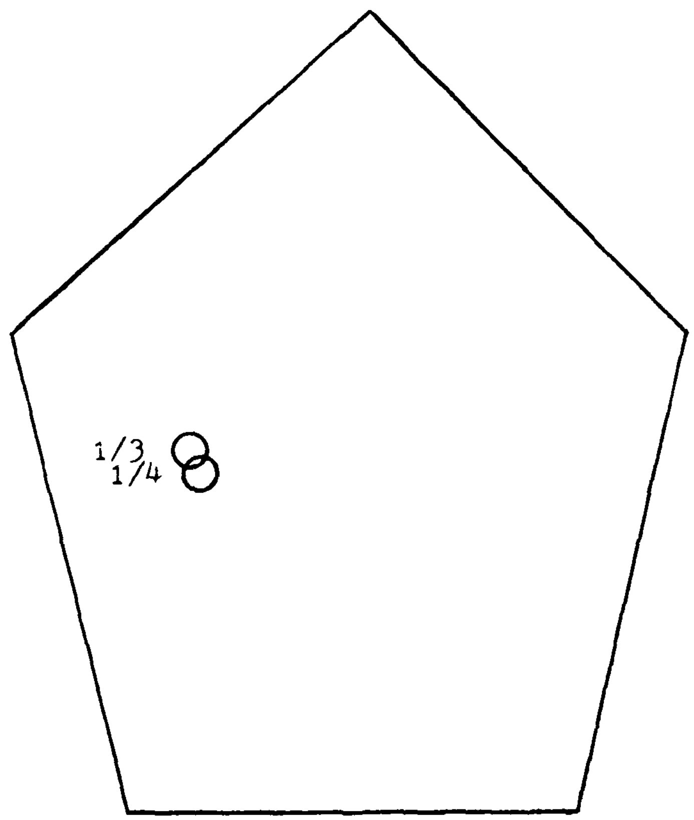

FIGURE 29: PERIOD 1 CLASSIFICATION OF NED BASED UPON ANALYSIS OF FORMAL STRUCTURE COMPARED TO THAT HYPOTHESIZED IN CHAPTER 3.

Division which appears to be the central element in program implementation during this period. The movement toward the Divisionalized Form results from the structuring of the Area Offices on a mini-Division geographic concept.

4.4. Analysis of Period 2 Structure, (1962-1968).

The analysis of financial data in section 3.4 suggests that the environment of period 2 is moderately complex and increasingly more hostile than in period 1. One expects the organization to be a Quasi-Machine Bureaucracy with overtones of Simple Structure due to the hostility of demands arising from the environment. This should be accompanied by an increased pyramidization in the middle line of the organization such as the number of branch elements. Yet, one still should see a wide at the bottom structure. This should be accompanied by a diversification of job responsibility at the lowest levels.

The organization structure from 1 August 1964 shown in appendix C is the baseline configuration of this period.

4.4.1. Engineering Division.

The Military Branch of the Engineering Division

decreased from 4 sections in period 1 to 3 sections in period 2 due to a declining military mission described in chapter 3. This resulted in combining the previous A-E Contracts Section with the Special Programs Section into a Review Section. In addition, the other two sections of this branch were reduced in personnel strength. These consolidations increased horizontal position responsibility as well as produced more market based grouping. This decreases the pyramid structure at the lowest levels.

The Design Branch redesignated the Coordinating Section to the Project Engineers Section and added the Civil Layout Section. (See Appendices B & C) This new arrangement suggests that the project engineers were more than facilitators or managers. This new configuration linked them with the technical section indicating that the project engineers were involved with initiating and establishing a program flow within the Design Branch. They now performed as heads of semi-permanent crossfunctional project teams. (See figure 13) This suggests that reliance upon their professional skills increased in period 2, thereby exerting a slight pull toward the Professional Bureaucracy.

Throughout the remainder of the Design Branch, one sees a reduction in personnel in each section compared to

period 1. This prevented specialization within a discipline in a section which was possible in period 1. The personnel reduction meant an increased workload for individuals in the operating core. This exerts a move towards the Simple Structure.

Comparing the Foundations and Materials Branch of period 2 with that of period 1, one can see that the structure was reorganized from purely functional sections to a combination of functional and market based ones. In period 1, the Foundations and Materials Section was reorganized into three functional sections: Concrete, Geology, and NED Laboratory Sections. This grouping by activity is characteristic of the Machine Bureaucracy. The consolidation of these activities in period 2 into a market based Civil & Military Design Section exerts a move towards the Divisionalized Form. Thus within this branch, one sees an overall movement towards the top of the Pentagon from the period 1 position.

The Engineering Division moved upwards from its period 1 position. Configurations still remain functionally based and individual positions appear to still be highly specialized. However, the reduction in personnel from 573 to 372 was accompanied by some market based groupings at the section level. The hierarchy still retained its pyramidal structure of narrow at the top and wide at the

base. Yet, there was a shift within program implementation as indicated by the presence of project engineers. This exerts a moderately strong move towards the Professional Bureaucracy.

4.4.2. Construction Division.

The Construction Division split the period 1 Supervision & Inspection Branch into two separate elements in period 2: Civil & Military Construction, and Inspection Branch. This increased the pyramid structure of the division and further specialized the jobs within each element. This grouping by activity/function exerts a strong movement towards the Machine Bureaucracy .

4.4.3. Area Offices.

Area Offices decreased from 9 to 5. Their grouping was still geographically based, however, they no longer resembled mini-divisions. (See the Boston Area Office in appendix C) Now the field offices contained only project management and inspection personnel. All technical support was provided from the Engineering Division. This configuration drew the Engineering Division more into the construction phase than in period 1 and made Area Offices more dependent upon support from NED Headquarters elements. This moved the organization away from the

Divisionalized Form towards the Simple Structure since Area Offices became more dependent upon direct support. This inserted an element of direct sup.rvision. This was increased reliance on standardized procedures to effect program implementation. These factors exert a tendency to move towards the top of the Pentagon to a Quasi-Machine Bureaucracy.

4.4.4. Other Elements.

Due to the program decline, the Real Estate Division suffered a 20% reduction in personnel during period 2. This was accompanied by elimination of all section elements. This resulted in job enlargement in both the vertical and horizontal directions enabling increased direct supervision of workers by the middle line. This exerts movement towards the Simple Structure. Thus, there is a general movement towards the upper right of Mintzberg's Pentagon from the period 1 position.

The Supply Division likewise suffered a 54% reduction in personnel from 71 to 33. The scope of this division's activities remained constant resulting in broadening of job position responsibilities. This exerts a move towards the Professiona Bureaucracy.

4.4.5. Conclusions.

The organization is a Quasi-Simplistic Machine Bureaucracy. (See figure 30) It lies to the right of that hypothesized in chapter 3 between the Machine Bureaucracy and the Simple Structure with a slight inclination inward towards the Professional Bureaucracy. It still retains its program replication appearance based on a high degree of functionalization. However, consolidation of numerous activities in both the Engineering Division and Area Offices as well as elimination of levels in the hierarchy exert a move towards the right top of the Pentagon. This suggests increased reliance upon the professional skills of the operating core and more direct involvement by the middle line in program implementation.

4.5. Analysis of Period 3 Structure, (1969-1973).

The environment of this period intensified in both complexity and instability as described in section 3.5. The former resulted from the shifting program priorities, while the latter resulted from the impact of NEPA on program implementation activities. The organization was hypothesized to be a Quasi-Professional Bureaucracy. One expects to see consolidation of functional areas into broad market based elements, especially in the technical areas. The Planning Branch should increase in importance manifested by an increase in functional grouping at the

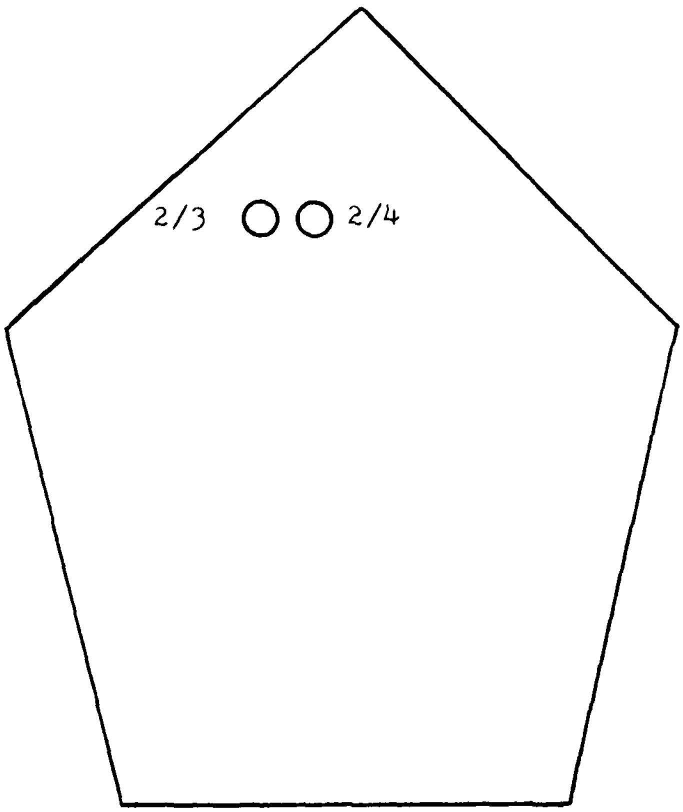

FIGURE 30: PERIOD 2 CLASSIFICATION OF NED BASED UPON ANALYSIS OF FORMAL STRUCTURE COMPARED TO THAT HYPOTHESIZED IN CHAPTER 3.

section level. In addition, project management implementation activities should increase in this period possibly at the branch level.

The organization structure from 1 February 1971 shown in appendix D is the baseline configuration of this period.

4.5.1. Engineering Division.

The Engineering Division underwent significant reorganization during this period due to increasing demands.

The Planning Branch grew tremendously. This resulted from the increased emphasis placed upon this phase of programs under NEPA. Although the number of sections within this branch decreased from 9 to 7, the diversity of activities undertaken increased. (See appendices C & D)

The seven highly specialized functional sections which existed in period 2 were consolidated into three sections in period 3: Comprehensive River Basin Section, Coastal Development Section and Special Projects Section. This new grouping was based upon broader activities and constituted market basing. In addition, it eliminated overlap of responsibilities which occurred under the

period 2 configuration between the Northeast Flood Studies Section and the Reservoir Development Section. A new section was created to increase the Planning Branch's responsibilities under NEPA: the Environmental Resources Section.

This total reorganization of the Planning Branch leads to movement in competing directions, increasing horizontal job specialization in some areas and broadening them in others. The pyramidal nature of the configuration was narrowed at the section level indicating a slight shift towards reliance upon worker skills, yet the functionalized structure still suggests standardization of process. These competing pulls draw the organization to a position between a Machine Bureaucracy and a Professional Bureaucracy.

The Technical Engineering Branch (formerly the Design Branch) underwent significant reorganization culminating in consolidation of functional areas into more broadly encompassing sections. This branch decreased from the 111 personnel in 1964 to 72 personnel in 1971. The Mechanical and Electrical Sections were now combined. (See appendices C & D) The increased activity in navigation projects pointed out in section 3.5 resulted in creation of a Navigation & Beach Erosion Section.

Thus one sees that the decrease in environmental demands for major programs significantly reduced functional areas. Yet, one also sees that the demand for a new type of program, navigation, caused the creation of a functional element. Although there is a slight move towards the Machine Bureaucracy, the overriding pulls behind the consolidation of the 12 functional based sections of 1964 into 9 in 1971 suggests stronger movement toward Professional Bureaucracy. This is strongly supported by the presence of an Engineer Training Unit under the direct control of the Engineering Division Chief.

The most important change in this branch is the loss of the Project Engineer Section. By 1971, this element became a separate branch in the Engineering Division. This indicates that the shift was towards project management as a means of implementing intra-divisional coordination.

Thus the Engineering Division reduced its width at the section level and increased it at the branch level by increasing from 9 to 12 branches. This presents a wide at all levels configuration increasing horizontal specialization of jobs while increasing vertical responsibilities. This exerts a strong movement towards the Professioal Bureaucacy with a weaker pull towards

Adhocracy due to reliance upon semi-permanent project teams.

4.5.2. Other Elements.

The Supply Division consolidated from 3 branches in period 2 to 2 in period 3. This occurred by combining Contract Administration Branch with the Supply Control & Distribution Branch, thereby increasing element activities at a time the division suffered a 50% reduction in personnel from 33 to 16. Individual position responsibilities increased in the horizontal direction requiring reliance upon professional skills at the lower levels to perform the work.

The Real Estate Division likewise suffered a 58% personnel reduction (43 to 18) and had to consolidate two branches (Acquisition and Management & Disposal) in reducing from 4 to 3 branches. This similarly increased position responsibility at the lower levels exerting movement towards Professional Bureaucracy.

The Construction Division suffered a personnel reduction culminating in consolidation of two branches. The Civil Construction Branch combined with the Inspection Branch to form the Supervision & Inspection Branch. Personnel strength in 1971 was 15 compared to 30 in 1964,

yet, diversity of contracts being administered had increased. In response to the commencement of the Postal Service Project in 1972, a separate branch was created within this division to handle the contracts.

The reorganizations within these elements resulted from a declining investment program described in 3.5. Consolidation within these three divisions narrowed the pyramidal nature of the total NED configuration at the base. This strengthened the move towards the Professional Bureaucracy.

4.5.3. Area Offices.

Area Offices fluctuated in number but still retained their market based characteristics of the previous period. The only noticeable change was a reduction in personnel strength at the Resident Offices. This placed greater emphasis upon individual management capabilities since the shift to an increased number of small projects increased reliance upon professional skills of the field personnel. This translated into an increased number of programs per man resulting in more travel time and less on site.

4.5.4. Conclusions.

Consolidation of branches within division elements

enlarged individual position responsibility. This decreased the hierarchical nature of the structure especially at the lower levels, thereby exerting a slight move towards the Simple Structure. This seems to have been offset by increased reliance on Project Managers at the upper levels of the program flow in the Engineering Division. This indicates increased reliance upon semi-permanent teams. This exerts a competing move towards the Adhocracy and reliance upon matrix structure.

Thus the period 3 organization is drawn downward and to the right of its period 2 position to that shown in figure 31. It is a Professional Bureaucracy and is quite close to that hypothesized in chapter 3. However, it leans more towards the Adhocracy due to the sudden shift to project management in the upper levels of the middle line.

4.6. Analysis of Period 4 Structure, (1974-1979).

The environment of this period is highly complex and uncertain as described in section 3.6. This resulted from funding impacts on major programs causing fluctuating priorities. Coupled with the effects of NEPA, this shifted attention to reliance on small projects which increased high project turnover with time and cost constraints impacting on program scheduling. The hypothesized configuration is an Adhocracy.

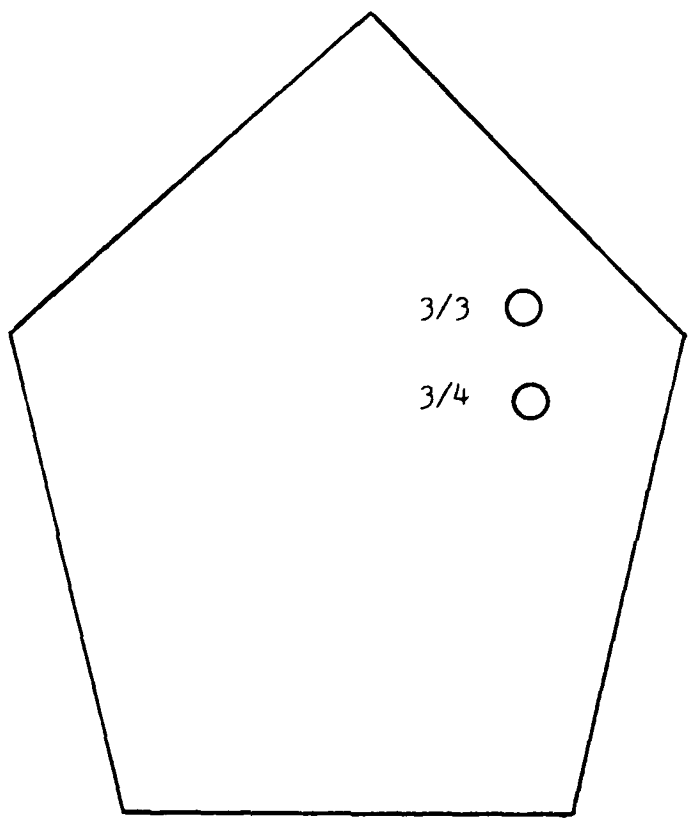

FIGURE 31: PERIOD 3 CLASSIFICATION OF NED BASED UPON ANALYSIS OF FORMAL STRUCTURE COMPARED TO THAT HYPOTHESIZED IN CHAPTER 3.

The organization configuration from 1 August 1975 shown in appendix D is the baseline configuration.

4.6.1. Engineering Division.

In 1974 both the Program Development Branch and the Planning Branch separated from the Engineering Division to become separate branches in the support staff and the technical staff respectively.

By removing planning and programming activities from the Enginnering Division, there was a redistribtion of power within NED. The Engineering Division was no longer the hub of program implementation. This reorganization mirrored the environmental shift to effective programming and accountability of actions which translated into increased planning and programming activities.

Although this shift tends to indicate a centralization of authority upwards by the Division Engineer, in fact this divestiture of Engineering Division activities necessitated more extensive coordination in program implementation. This change exerts an extremely strong movement towards reliance upon the matrix structure of the Adhocracy.

Although appendix E shows the Technical Engineering Branch consisted of 9 sections, in 1978 this branch was reorganized from 9 to 6 sections. (Not shown) Specifications and Estimates Sections were combined, and Civil Layout and Utilities Sections were combined into the Civil Engineering Section. This consolidation decreased pyramidal structure at the section level through increased market based groupings. This enlarged individual position responsibility in the horizontal direction at the operating core level. These factors draw the organization downward to the left of Mintzberg's Pentagon toward Adhocracy.

In addition, the Engineering Division decreased from 9 to 5 branch elements in period 4. (See appendix E) Although these branches still retained a functional based grouping at the branch level, breadth of activities at the section level increased. Hence, they became increasingly more market based. (See the Technical Branch and Foundations & Materials Branch appendix E & D) These factors support movement towards the Adhocracy.

The Project Management Branch increased in personnel during a time when the Engineering Division reduced from 265 personnel in period 3 to 183 in period 4. The shift towards small projects increased reliance on semi-permanent cross-functional teams. This tremendous

growth was environmentally induced, and displays a strong move towards the adhocracy.

4.6.2. Planning Division.

In comparing the Planning Branch of period 3 to the Planning Division of period 4 one can see expansion and growth. (See appendices D & E) The division increased from 58 to 84 personnel and added two new sections which were subelements of the Environmental Analysis Branch. This structure exerts a slight move towards the upper left of Mintzberg's Pentagon.

4.6.3. Area Offices.

The declining civil works program during the period 4 further reduced the Area Office staffs. However, groupings remained geographically based. The increased number of separate elements in NED imposed increased coordination requirements on the Area Offices. This increased reliance on the professional skills of the construction phase managers thereby drawing the organization to the right of Mintzberg's Pentagon.

4.6.4. Conclusions.

The organization is characterized as a nearly pure

Adhocracy. (See figure 32) This lies slightly above that hypothesized in chapter 3. It consists of consolidated functional areas in the Planning, Engineering and Construction Division which are characteristic of market based grouping. The emergence of a separate Project Management Branch indicates that the elevation of this activity from a period 3 section level is tied to an increased reliance on semi-permanent project team program implementation. Coupled with the separation of both the Planning Branch and Programs Branch from the Engineering Division, this suggests that the project management activities involve an increased utilization of inter-divisional coordination through informal means in both the planning and design phases of programs. The decrease in Area Office personnel strengths also suggests more reliance upon on matrix organization in the construction phase. These factors draw the organization toward the Adhocracy.

4.7. Analysis of Period 5 Structure, (1980-1984).

The environment of this period remained dynamic and relatively uncertain as described in section 3.7. Small projects sustained the complex and diverse investment program observed in period 4. However, in period 5, NED appears to have adjusted to reliance on this fluid program spectrum as described in section 3.7. The configuration

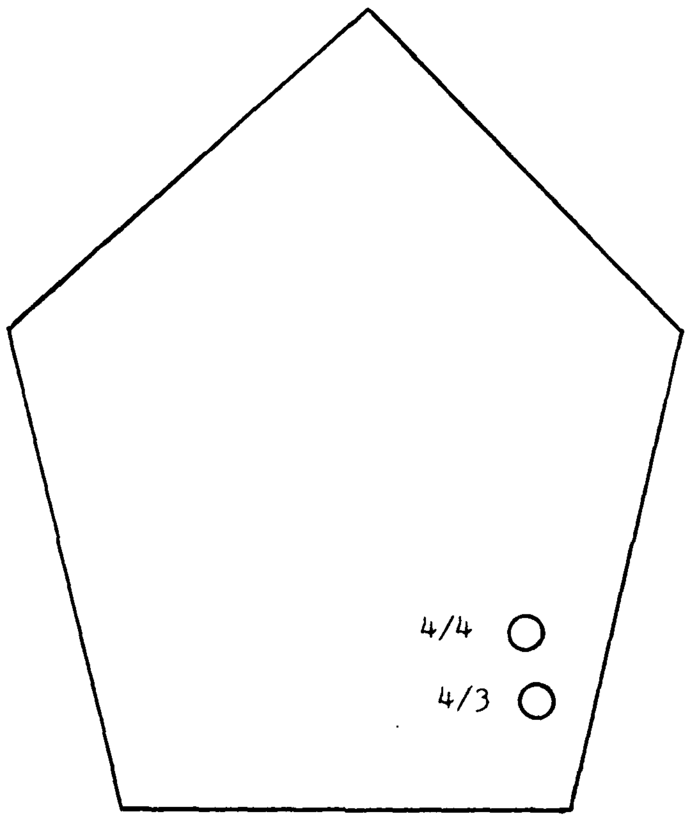

FIGURE 32: PERIOD 4 CLASSIFICATION OF NED BASED UPON ANALYSIS OF FORMAL STRUCTURE COMPARED TO THAT HYPOTHESIZED IN CHAPTER 3.

hypothesized for this period is a Simplest Entrepreneural Adhocratic Structure lying mid-way between Simple Structure and Adhocracy. One expects increased functional grouping in the planning elements as their mission becomes more central to major program implementation. In addition, continued emphasis on project managers is expected. However, continued consolidation of functional areas in the technical engineering elements is expected as the focus of NED activities shifts to planning. This will increase reliance upon cross-functional teams in an inter-divisional role to effect coordination. One suspects this will result in the use of project managers in all three implementation divisions: Engineering, Planning and Construction. This will force more decentralized coordination/decision making to lower levels.

The baseline organizational configuration is from 1 August 1981. (See appendix F)

4.7.1. Engineering Division.

The Engineering Division continued to suffer consolidation of its activities. (See appendices E & F) The Design Branch was reduced in personnel from 70 in 1975 to 64 in 1981. This was accompanied by a consolidation of 9 sections into 5, thereby decreasing the hierarchical

pyramid within this branch. Numerous activities were consolidated under the new Civil Engineering Section. This action resulted in horizontal job enlargement at the operating core level. In March 1982, the Design Branch further consolidated the Structural, Mechanical/Electrical and Specification/Estimates Sections into a General Engineering Section. (Not shown) This reduced the number of sections from 5 to 3. Again, broad discipline groupings intended to undertake package programs were established. These factors display movement toward the lower right of Mintzberg's Pentagon.

The Water Control Branch increased from 17 personnel in 1975 to 24 in 1981. This was a result of an expanding mission which had its roots in the 1965 Water Quality Control Act as well as the increasing operations and maintenance of completed reservoirs. This growth was accompanied by increased specialization of individual positions within the branch. This exerts a weak move towards the upper left of the Pentagon.

The Engineering Division was reduced in personnel from 183 in 1975 to 140 in 1981. This was accompanied by tremendous consolidation of technical discipline activities resulting in broadly based market groupings at the section level within the Design Branch. The overall trend was to decrease the pyramidal nature of the division

structure at the bottom. Especially noteworthy is the fact that the Project Management Branch remained at 24 personnel. This significantly increased the ratio of project management to personnel within this division by 4% from 13% in 1975 to 17% in 1981. These factors display strong movement towards the Adhocracy.

4.7.2. Construction Division.

The Construction Division increased in personnel from 12 in 1975 to 30 in 1981. This resulted from the addition of an EPA Support Branch of 18 personnel to manage the Environmental Protection Agency's Superfund Program. The creation of a separate element to handle a new mission indicates functional based grouping within this division. Although this branch is not involved in investment program implementation, this tendency to establish separate functional elements to undertake new missions was also seen in the growth of the Engineering Division in period 1 and the growth of the Planning Division in period 4. This exerts a weak move towards the upper left of Mintzberg's Pentagon from the period 4 position.

4.7.3. Planning Division.

The Planning Division continued to expand its hierarchy during this period. (See appendices E & F) The division

reorganized from 7 to 5 branches. This was accompanied by creation of 6 additional section level elements and 5 unit level elements. In order to effect this multi-tiered hierarchy, numerous functional areas which had some overlap of activities in period 4 were reconfigured into separate and distinct functional group elements in period 5. This resulted in a three level configuration within the Impact Analysis Branch compared to its predecessor the Environmental Analysis Branch which had only two levels.

A similar diversification at the lower levels is observed in the Plan Formulation Branch which created two sections. This increased functionalization of elements was accompanied by a moderate growth in personnel from 84 in 1975 to 91 in 1981. This is especially significant since during the same period NED reduced in personnel from 622 to 591.

Thus one sees a growth of 8% within the Planning Division during a time when organizational growth was a -5.4%. This suggests that the environmental demands for effective and comprehensive planning as well as the shift to a more diverse spectrum of programs influenced this change. This functionalized layered hierarchy was accompanied by horizontal and vertical job specialization. These factors suggets a very strong move toward the upper left of Mintzberg's Pentagon from the period 4 position

depicted in figure 32.

4.7.4. Other Elements.

Environmental demands for more accountability increased the importance of both the Program Development Office and the Office of the Comptroller. (See appendices E & F) This resulted in increased functionalization of activities in the former accompanied by a 40% growth in personnel. By August 1983, the Program Office had created 3 distinct branches along functional activity lines. Likewise the Office of the Comptroller increased in personnel by 20% and diversified from 2 to 4 section level units.

Although these increases in the layered hierarchy indicate movement towards the upper left of the Pentagon based on increased functionalization and pyramiding of the structure, one has to remember that this is a growth of the support staff during a period of negative organizational growth. As Mintzberg points out, a high elaboration of the support staff especially in comparison to the remainder of the organization is characteristic of the Adhocracy. Thus, these factors display movement towards the lower right of the Pentagon.

4.7.5. Conclusions.

The organization is a Simplest Entrepreneurial Adhocratic Structure. (See figure 33) This lies below and slightly to the left of that hypothesized in chapter 3 almost in the center of Mintzberg's Pentagon resulting from competing pulls within the organization. The emerging importance of planning and feasibility design in the planning phase elevated the importance of the newly formed Planning Division. This resulted in increased functionalization within subelement groupings producing a highly layered structured with distinctly specialized elements. This is similar to the growth seen the Engineering Division in period 1 to cope with its increased mission responsibilities. This displays strong movement toward the Machine Bureaucracy. The further consolidation of activities at the Branch and Section level in the Engineering Division result in broadly based market groupings along multi-engineering discipline lines. Coupled with the growth and functionalized grouping of the Support Staff these factors exert a counter movement towards the Adhocracy.

4.8. Conclusions.

Classification of the NED organization within each period was accomplished along the dimension of structural differentiation. This chapter conducted an analysis of NED based on the dimension of differentiation. The

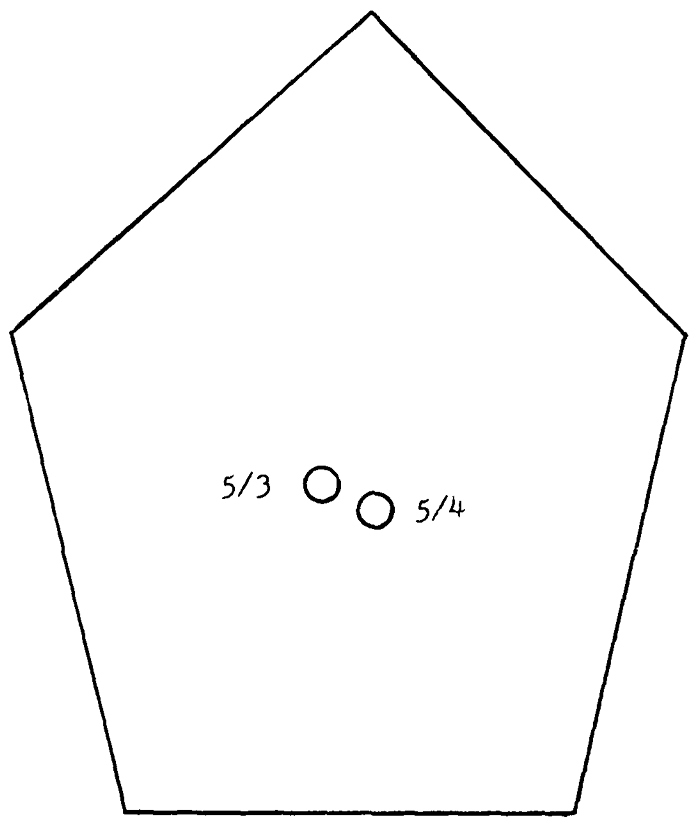

FIGURE 33: PERIOD 5 CLASSIFICATION OF NED BASED UPON ANALYSIS OF FORMAL STRUCTURE COMPARED TO THAT HYPOTHESIZED IN CHAPTER 3.

results of this analysis demonstrated remarkable consistency with those hypothesized in chapter 3.

5. ANALYSIS UTILIZING PROJECT FILES.

The objective of this chapter is to identify the formal integration mechanisms and associated liaison devices utilized within NED to coordination investment program activities. This will be accomplished by analysis along the dimension of formal integration. The hypothesized organizations of chapter 3 will serve as a basis of comparison.

5.1. Methodological Overview.

Since the analysis of chapter 3 identified distinct program trends within each period such as small versus major or flood control versus navigation, the decision was made to ensure the selection of projects was consistent with these trends. Prior to identifying the projects however, it was necessary to develop a method of data collection and classification.

5.1.1. Subdimensions.

The analysis of chapter 3 indicated that a general approach should focus on measurements along three subdimensions: interaction with the external environment, reliance on formal liaison devices, and documented

reliance upon informal liaison devices. The first subdimension would facilitate assessment of the mediating variables. The next two subdimensions would enable evaluation of internal integration and liaison devices utilized. These factors would enable identification of the integration mechanism(s) utilized. This would allow classification of the organization within each period.

5.1.2. Data Classification

The accuracy of this analysis was dependent upon the categorization of the data extracted from projects files along the three subdimensions identified above. Since this method of data classification would result in three tables per period, the question of the level of detailed pigeon holing became crucial. In order to resolve this problem, it was necessary to preliminarily review several project files at random to obtain a 'feel' for the extent of data available. This would provide insight into the selection of data categorization, thereby determining the number of project files to be studied.

Four projects were selected, 3 major and 1 small, each from a different period. This preliminary review revealed that project files contained numerous items which could be categorized within each subdimension producing as detailed a breakdown as desired. It was determined to develop a rather broad classification within each subdimension, and

to supplement this by poignant note taking to clarify relevant aspects of each project. Three project files per period were selected for a total of 15. Figure 34 depicts the projects selected and the duration in years each file covered from the planning phase through construction.

5.1.3. Data Presentation.

The final step in this procedure was to develop the matrix charts to compile the data. Tables 1 through 3 present the data gathered for period 1. Each table of this figure measures one subdimension identified previously.

Table 1 depicts interaction of elements within NED with the external environment. This facilitates identification of the mediating elements within NED as well as the environment with whom NED interacts: Societal and/or Political. The Societal dimension is called the public. This encompasses private individuals, local industries, and private utilities. The Political dimension is broken down into two categories: Politicians and Agencies. The politician category encompasses the executive and legislative bodies from a local level up to federal level. The Agency category is an extremely broad element encompassing any representative of a local, state or federal department or bureau. Examples of this are: the

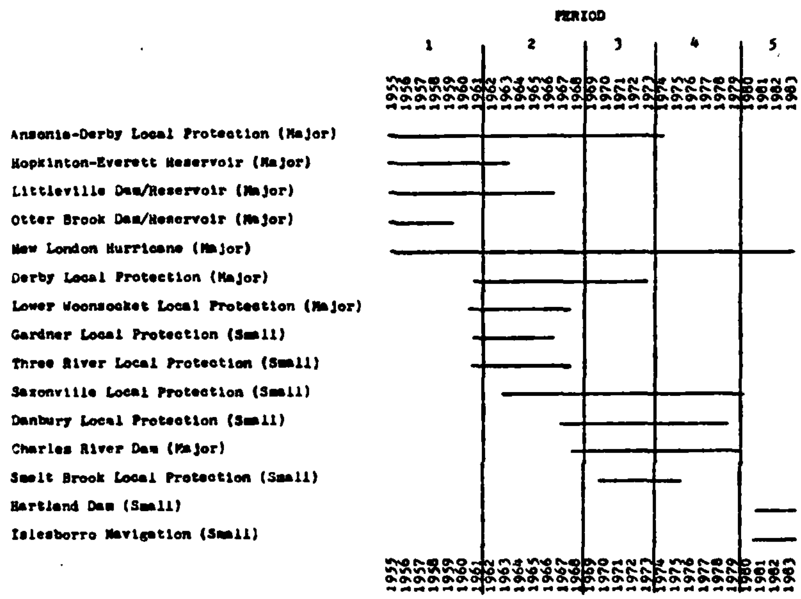

FIGURE 34: PROJECTS ANALYZED IN CHAPTER 5.

	Agencies	Politicians	Public
NED Commander	70	204	58
Engineering Division Chief	119	7	99
Project Engr/ Manager	3	2	0
Technical Reps/Other	3	3	8

TABLE 1: PERIOD 1 MEASUREMENT OF WHAT NED ELEMENT INTERFACED WITH THE ENVIRONMENT.

	Inter-Divisional	Intra-Divisional
Level to Level (Not by Chain-of-Command)	95 / 6	37 / 3
Chain-of-Command	181 / 19	155 / 24

TABLE 2: PERIOD 1 MEASUREMENT OF NED RELIANCE ON FORMAL COMMUNICATION.

		Internal	External
Project Engr or Manager Directly Involved	Yes	7	16
	No	4	26

TABLE 3: PERIOD 1 MEASUREMENT OF NED RELIANCE ON MEETINGS.

City Manager, State Department of Fish and Wildlife, and the Environmental Protection Agency.

Table 2 depicts the reliance on formal correspondence within NED. Classification is performed along both inter- and intra-division/separate branch levels. This is complemented by categorizing the level at which these communications occurred, either utilizing the structural hierarchy (chain of command) or crossing from element to element (non-hierarchical). The established hierarchy per period is the baseline organization structure of each period identified in appendices B through F. In addition, a subcategory shown below the slashed line indicates the number of formal pieces of correspondence referring to previous direct coordination (phone calls or personal contact). This table will facilitate assessment of both inter- and intra-major element reliance upon liaison devices as well as coordination mechanisms.

Table 3 depicts the reliance on meetings to effect coordination. This table will facilitate identification of the level at which meetings occurred: managerial hierarchy, integrating departments or project managers. This accomplished by categorizing meetings as either involving NED personnel only or involving external elements such as the public or agencies. This is complimented by a classification of being chaired by the

Project Engineer/Manager (if he attended) or other. The "other" category is supplemented by project file notes to determine at what level within NED the meeting was chaired: another technical representative or the managerial hierarchy. This chart also facilitates assessment of the integration mechanism(s) utilized based on the reliance of this liaison device to effect coordination in comparison to the formal correspondence of table 2.

The data presented in these tables was broken down into percentages both by column and by row within and between categories during the analysis to identify trends. These percentages are presented in the context of the discussion of each period and are not replicated in tabular form since their derivation will be obvious.

5.2. Analysis of Period 1 Integration, (1955-1961).

The structural configuration hypothesized in section 3.3 is a Quasi-Machine Bureaucracy with overtones of a Divisionalized Form. One expects this to be accompanied by coordination through standardization of the work process with some standardization of outputs in specific elements. These integration mechanisms rely heavily upon a paper system with some reliance upon integrating personnel/departments. This is manifested by an extremely

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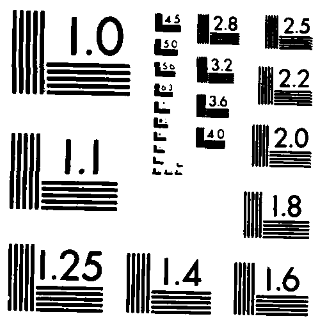

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

centralized operation in both the horizontal and vertical directions. Thus one would expect to see a tremendous portion of the coordination to depend on the formalized hierarchy. This should be accompanied by a strong mediating mechanisms reliant upon position authority in their interaction with the external environment.

5.2.1. Table 1.

The interaction with the environment is undertaken predominantly by the Engineering Division Chief and the Commander of NED (Division Engineer). 97% of all correspondence with the external environment is accomplished by these two elements: 58% by the Division Engineer and 39% by the Chief of the Engineering Division.

The Division Engineer was concerned with factors arising in the external political environment in 61% of all his actions. This high percentage resulted from demands for responsive action by NED from US Congressmen/Senators on behalf of their constituents in the aftermath of the devastating floods of the mid 1950's. The majority of these demands occurred during the planning phase and early design phase of four projects studied: the New London Hurricane Protection Barrier, Hopkinton-Everett Flood Control Reservoir, Lower Woonsocket Local Protection

Flood Control Project, and the Littleville Dam Project. The latter two projects also involved extensive communication with local town Mayors.

The Chief of the Engineering Division interacted with factors arising in the agency aspect of the environment in 53% of all his actions and with factors arising from the public element in 44% of his actions. The majority of his interactions with agencies were of a direct coordination nature in order to obtain information to effect NED planning and/or design, or requests for review of proposals. This was very prominent on the Otter Brook Dam Project, Hopkinton-Everett Flood Control Reservoir and New London Hurricane Protection Barrier Project. His interaction with the public aspect of the external environment generally was to provide information to private citizens, local interests groups and private industries who were affected by a project and/or expressed an interest in a project. The preponderance of correspondence in this category was confined to the Littleville Dam Project and the Ansonia-Derby Local Protection Flood Control Projects.

The relatively high percentages indicated in the three categories above indicate that both the Division Engineer and the Chief of the Engineering Division were relying upon their position authority/expertise to delineate

responsibilities for interaction with demands arising from the external environment. The overlap in responding to demands arising from the public between these two individuals generally involved real estate acquisition problems which had to be elevated to the Division Engineer when they impacted upon program implementation. The remaining 3% interaction by Project Engineers and others is relatively insignifcant. This suggests that both the Division Engineer and the Chief of the Engineering Division were quite successful in mediating the effects of environmental demands thereby enhancing the stability and certainty of the environment in this period.

5.2.2. Table 2.

The bulk of formal communication (memos) within NED was passed along the formalized hierarchical structure (chain of command). 72% of this communication followed the established organization hierarchy while only 28% flowed outside "normal" channels. Within major elements (intra), 81% of all communication followed the presribed managerial hierarchy. These facts suggest reliance upon the managerial hierarchy through standardization of flows to integrate activities.

Between major elements (inter), 66% of all communication followed the established organizational

hierarchy. This further substantiates reliance upon standardized flows to achieve coordination within NED.

The content of memos reviewed during this period indicated that they generally passed information essential to coordination and/or requested actions to take place. Violations of these standardized flows generally occurred within major elements (intra) during the planning phase of projects. This was very noticeable on the New London Hurricane Protection Project where cross level coordination occurred between the Planning & Reports Branch, the Hurricane Protection Unit and the Foundations & Materials Branch of the Engineering Division. However, thist crosslevel correspondence was not proportional to that observed on other projects studied in this period.

The high percentage of of inter-major element communication (34%) outside the prescibed organizational structure occurred during the construction phase of the Otter Brook Dam project. Direct correspondence between the Chief of the Engineering Division and the Area Office occurred without going through the Construction Division. This resulted from command influence because this earthen dam was a prototype under consideration within the Corps for adaptation for wider use throughout the US. Thus, it had unusually high visibility which balooned the figures in this category by approximately 100% compared to other

projects.

Only 11% of all formal correpondence served as backup to direct coordination through phone calls or personal contact. The highest percentage was 13% in the intra-major element category utilizing the established hierarchical structure. This relatively low reliance upon direct contact to achieve coordination in comparison to formalized correspondence might suggest either that the lower level managers resolved their problems informally which will be assessed in chapter 6, or they were reliant upon the formalized paper flow adhering to established channels as observed in the project files.

5.2.3. Table 3.

The majority of all formal meetings (79%) occurred with elements outside NED such as local agencies. The remaining 21% was internal coordination activities which relied upon integration personnel (project engineers) to effect activity coordination, especially during the design phase.

43% of all meetings involved a Project Engineer suggesting a moderately strong reliance upon integrating personnel in program implementation. However, half of these entries were from the Otter Brook project which

suggests that this liaison device was not a typical instrument to effect integration within NED during this period.

57% of all meetings were chaired by the managerial hierarchy. This was observed on the Ansonia-Derby, and Hopkinton-Everett Projects where the NED Division Engineer and/or the Chief of the Engineer Division chaired over 7 meetings between them. They effected coordination through integration facilitator role playing during internal coordination meetings. They also utilized external meetings as a mechanism to extend their mediating responsibilities with the external environment.

5.2.4. Conclusions.

The organization is a Carbon Copy Bureaucracy. (See figure 35) It is above and to the left of that hypothesized in chapter 3. It interacted with its environment through strong mediating mechanisms. Internal coordination was achieved through a hierarchical paper system reliant upon the managerial hierarchy. This was manifested by much vertical flows both within and between major elements. The reliance upon the Chief of the Planning Branch to implement small projects exerts a slight movement towards decentralized activities characteristic of the Divisionalized Form. It thus

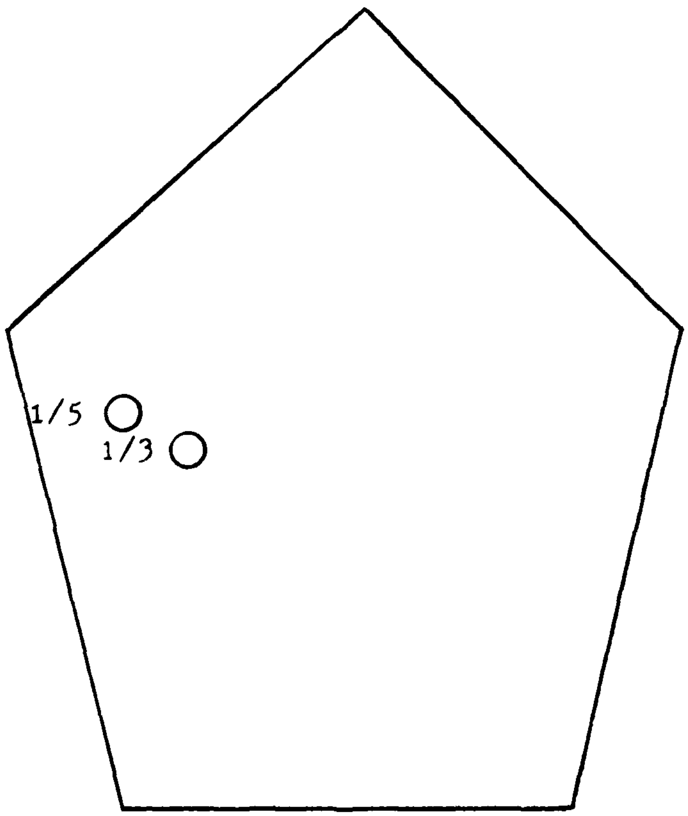

FIGURE 35: PERIOD 1 CLASSIFICATION OF NED BASED UPON ANALYSIS OF FORMAL COORDINATION COMPARED TO THAT HYPOTHESIZED IN CHAPTER 3.

provided him with target objectives enabling weak movement towards standardization of outputs. However, organization activity integration was accomplished by standardization of processess.

5.3. Analysis of Period 2 Integration, (1962-1968).

The configuration hypothesized in section 3.4 is a Simplest Machine Bureaucracy. One expects this to be accompanied by coordination through standardization of the work processes. This suggests an increased reliance upon the upper managerial hierarchy. The accompanying integration mechanism is a paper system. This suggets that reliance upon integration personnel/departments should decrease being replaced with more vertical flows within the formal organizational structure. This results an extremely centralized operation suggesting a decrease in nonhierarchical communication in comparison to period 1. One expects this to be accompanied by a stronger mediating mechanism(s) interfacing with the environment in comparison to period 1.

5.3.1. Table 4.

Interaction with the environment is undertaken predominantly by the Chief of the Engineering Division and the Division Engineer. 98% of all correspondence with the

	Agencies	Politicians	Public
NED Commander	47	119	6
Engineering Division Chief	245	8	196
Project Engr/ Manager	0	0	4
Technical Reps/Other	3	4	3

TABLE 4: PERIOD 2 MEASUREMENT OF WHAT NED ELEMENT INTERFACED WITH THE ENVIRONMENT.

external environment is accomplished by these two individuals in period 2: 27% by the Division Engineer and 71% by the Chief of the Engineering Division. A significant aspect of this interaction is the shift of mediating activities from period 1 to period 2.

In period 1, interaction with agencies was accomplished by both the Division Engineer (36%) and the Chief of the Engineering Division (61%).(See tables 2 & 4) However, in period 2 this changed to 16% by the Division Engineer and 83% by the Chief of the Engineering Division. In comparing the interaction with the public element one sees a similar trend: a decrease from 35% to 3% for the Division Engineer and an increase from 60% to 94% for the Chief of the Engineering Division.

These shifts resulted from two factors.

First, increasing public concerns for accountability in the latter half of period 2 heightened the intensity and hostility of political interactions on behalf of constituents. Projects such as the Saxonville Local Flood Protection, Danbury Local Flood Protection and Charles River Dam required more interaction with political demands due to their controversial nature. This was coupled with an increasingly complex spectrum of programs which had several highly technical projects in the design phase such

as Charles River Dam.

Secondly, the intense growth of period 1 as well as project complexity established centers of expertise within the Engineering Division. Project diversity as well as volume demanded an increased interaction with the environment. Since coordination with local agencies increased substantially, it was natural for these shifts to occur.

The apparent success of these mediating elements w attributable to the relatively certain and stab e environment which enabled them to structure distinct domains.

5.3.2. Analysis of Table 5.

The preponderance of formal communication within NED flowed within the formal hierarchical structure (57%) rather than outside it (43%). (See table 5) There was a decreased flow within the hierarchical structure by 15% from the period 1 72% level. This was accompanied by a reciprocal increase of nonhierarchical communication from 18% to 43%. These trends are contrary to that hypothesized in chapter 3.

Four of the eleven projects under some phase of

	Inter-Divisional	Intra-Divisional
Level to Level (Not by Chain-of-Command)	178 / 6	108 / 31
Chain-of-Command	187 / 32	189 / 66

TABLE 5 : PERIOD 2 MEASUREMENT OF NED RELIANCE ON FORMAL COMMUNICATION.

implementation during period 2 were small projects. In period 1, 2 of 9 were small projects. More importantly, of these 4 small projects in period 2, all were in the design phase while in period 1 the 2 under implementation were in the planning phase. The significance of these small projects in period 2 is that unlike the major projects observed in period 2, the small projects revealed a tremendous amount of nonhierarchical communication of a branch to branch or branch to section nature within the Engineering Division.

A review of the Gardner, Saxonville, Three River Local Protection, and Danbury project files revealed that the Chief of the Planning and Reports Branch of the Enginering Division interacted directly with other elements of this division. Correspondence with the Foundations & Materials Branch and Design Branch was especially heavy. This trend of cross level communication on small projects was not observed on the seven major projects studied in period 2.

Thus 43% of the formal coordination occurring outside prescribed channels is severely distorted by the impact of 4 small projects in the design phase. This leads one to suspect that the Chief of the Engineering Division focused his attention on major programs and left the small projects to the ingenuity and resourcefulness of the Chief

of the Planning & Reports Branch. These factors suggest a strong reliance upon the managerial hierarchy to effect coordination through standardization of processes supplemented by direct supervision on major programs, while decentralizing decision making relying upon standardization of skills on small projects. This is substantiated by the high percentage (64%) of formal hierarchical communicaton within major elements.

Within the intra-major element category, reference to verbal/personal contacts increased from 13% in period 1 to 22% in period 2. This resulted from an upward flow of information by the Chief of the Planning & Reports Branch on small project coordination. In addition, inter-major element nonhierarchical communication increased during the construction phase during period 2. This occurred on major projects where the Area Engineer circumvented the Chief of the Construction Division and coordinated directly with the Chief of the Engineering Division. Although this increased from 34% in period 1 to 48% in period 2, it was accompanied by a decrease from 20% to 3% of memos referencing direct contact in coordinating activities. This suggests a more formalized flow characteristic of direct supervision and/or standardization of process.

Documentation of hierarchical coordination between

major elements also decreased from 89% in period 1 to 68% in period 2. Coupled with an increase an in hierarchical coordination (76% to 84%) this suggests that decision making was elevated within major elements.

In period 2, coordination relied mainly on the managerial hierarchy both within and between major elements. This suggests that division or separate branch chiefs performed inter-element integration activities. These factors exert movement towards both standardization of processes and direct supervision.

5.3.3. Table 6.

Meetings with elements outside NED increased from 79% in period 1 to 85% in period 2. (See table 5) The reduction in the number of internal meetings, considering the increased volume of projects in period 2, suggests that internal coordination was not facilitated by integrating departments/personnel such as Project Engineers. Rather it suggests that reliance upon the managerial hierarchy increased in order to effect integration.

Reliance upon Project Engineers to effect coordination through meetings with the external environment increased from 43% in period 1 to 73% in period 2. However, this

Project Engr or Manager Directly Involved		Internal	External
	Yes	17	84
	No	4	34

TABLE 6: PERIOD 2 MEASUREMENT OF NED RELIANCE ON MEETINGS.

resulted almost exclussively from the small projects program which appeared to be delegated by the Chief of the Engineering Division to the Chief of the Planning & Reports Branch. Otherwise, external meetings on major programs tended to be a chain-of-command affair as noted by the numerous meetings between the Division Engineer or Chief of Engineering and local agencies/politicians on the Ansonia-Derby Local Protection project.

5.3.4. Conclusions.

The organization is a Simplest Machine Bureaucracy. (See figure 36) This is to the right of that hypothesized in chapter 3. The mediating elements solidified their positions along clearly delineated domains. Dependence upon a managerial hierarchy supported paper system both within and between major elements increased over that observed in period 1. Coupled with a decreased reliance upon direct manager contacts, this indicates increased formality. These facts indicate an elevation of decision making, thus exerting movement towards the top of the Pentagon.

The increase in hierarchical project flows retains overtones of standardization of processes observed in period 1, while the need for professional skills pulls weakly towards the right of the Pentagon. Activity

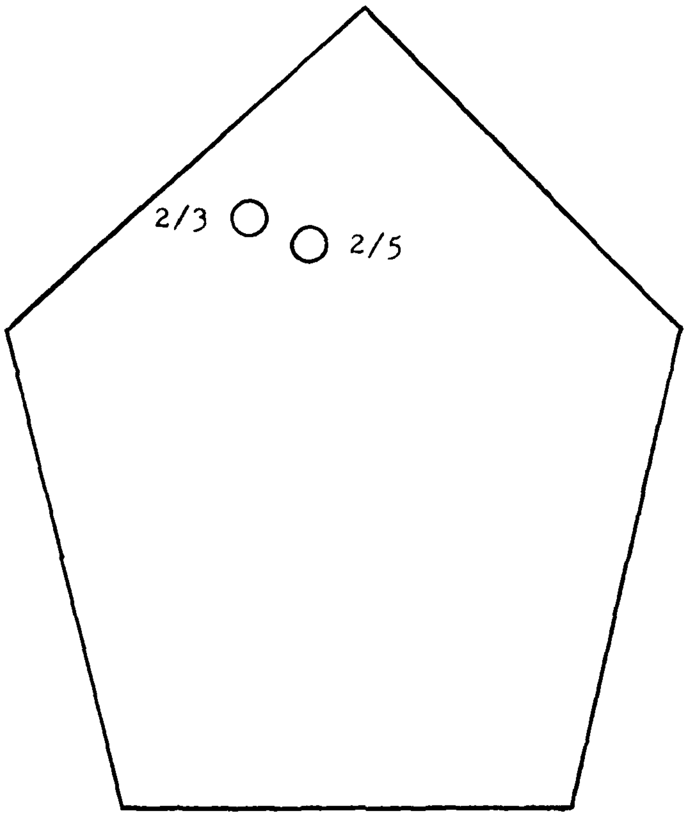

FIGURE 36: PERIOD 2 CLASSIFICATION OF NED BASED UPON ANALYSIS OF FORMAL COORDINATION COMPARED TO THAT HYPOTHESIZED IN CHAPTER 3.

coordination was still achieved through standardization of process, but was more dependent upon formalized decision making than in period 1.

Since chapter 3 revealed that major programs compromised 97% of the civil works investment programs of this period, one can safely relegate the impact of the small projects on formal integration to a secondary nature.

5.4. Analysis of Period 3 Integration,(1969-1973).

The structural configuration hypothesized in chapter 3 is a hybridized or dispersed Professional Bureaucracy. One expects this to be accompanied by coordination through standardization of skills. This suggests increased reliance upon the lower middle line and operating core accompanied by increased utilization of temporary crossfunctional teams, thereby increasing reliance upon Project Managers to effect coordination. This should result in a decreased paper system flow along the hierachical structure. Lastly, one expects to see an increased interaction of the Project Manager in a mediating capacity with external agencies/public. This should be accompanied by a decrease in the mediating activities of the Division Engineer and the Chief of the Engineering Division.

5.4.1. Table 7.

Interaction with the environment still was undertaken by the Division Engineer and the Chief of the Engineering Division. 93% of all formal coordination with the external environment was accomplished by these two individuals in period 3: 22% by the Division Engineer and 71% by the Chief of Engineering. The percentage of interaction between the Division Engineer and the political environment and the Chief of Engineering with the agency environment also remained relatively constant in comparison to period 2.

Interaction with the public by the Chief of Engineering decreased from 94% of the total public interaction in period 2 to 75% in period 3. This resulted from an increased interaction by both Project Managers and Branch/Section Chiefs. This suggets that the environment became to complex for one individual to handle necessitating delegation of this activity to subordinates based on demonstrated potential. This increased reliance upon technical experts to assist in minimizing demands and trarslating them into alternatives for action. This was observed on projects such as Danbury and New London.

5.4.2. Table 8.

	Agencies	Politicians	Public
NED Commander	22	57	9
Engineering Division Chief	181	8	101
Project Engr/ Manager	0	2	17
Technical Reps/Other	0	2	9

TABLE 7: PERIOD 3 MEASUREMENT OF WHAT NED ELEMENT INTERFACED WITH THE ENVIRONMENT.

Formal communication in period 3 still flowed within the formal structure (54%) rather than outside hierarchical lines. (See table 8) However, there was a slight increase (3%) in nonhierarchical communication pushing towards a more balanced distribution within NED as a whole.

Within the intra-major element category however, the nonhierarchical coordination increased from 36% in period 2 to 58% in period 3. In other words, reliance upon formal hierarchical intra-major element coordination decreased from 64% to 42%. This tremendous shift resulted from more cross level coordination at the branch, section and project manager levels within the Engineering Division in period 3. This was very evident on both small projects (Saxonville and Danbury) and major projects (Derby and Charles River) studied.

Extensive coordination occurred between Project Management Branch and the Technical Engineering Branch, Foundations & Materials Branch and sections of these elements. Often, it resulted from a verbal directive by the Chief of the Engineering Division which eventually resulted in an upward response from Project Management after this cross level coordination had resolved the problem. In conjunction with this increase, documented

	Inter-Divisional	Intra-Divisional
Level to Level (Not by Chain-of-Command)	164 / 33	194 / 47
Chain-of-Command	277 / 35	141 / 55

TABLE 8: PERIOD 3 MEASUREMENT OF NED RELIANCE ON FORMAL COMMUNICATION.

reference to direct coordination within the intra-major element nonhierarchical correspondence increased from 32% in period 2 to 46% in period 3. These factors suggest increased reliance upon coordination by standardization of skills during the planning and design phases of projects. This was manifested by increased reliance upon integrating personnel (project managers) heading temporary crossfunctional teams. This was tempered, however, by the interaction occuring at the managerial level rather than the operating core level.

The intra-major element paper system served as an information passer more in period 3 than in period 2 where it seemed to be the tool to resolve conflict/coordinate actions. One sees the reverse trend in the inter-major element category in period 3. Reliance upon the formal hierarchical coordination increased from 52% of inter-major element correspondence in period 2 to 63% in period 3. This was accompanied by a decrease in nonhierarchical coordination (48% to 37%). This latter point resulted from an increase in correspondence between the Chief of Engineering and Division Counsel, Chief of Construction and Chief of Real Estate on the Derby Project. This was coupled with a tremendous amount of correspondence between the Chief of Engineering and Chief of Construction regarding contract problems on the Charles River Dam and Ansonia-Derby Projects. These factors

weighted the figure in this category towards hierarchical coordination since they comprise only 3 of the 7 projects studied. If subjective qualification based on project file review is considered, the period 3 figure in the inter-major element category should be relatively consistent with those of period 2. The only significant change was an increase in verbal coordination between the Area Engineer and the Engineering Division Project Manager (inter-major element nonhierarchical) from 16% of inter-major element coordination in period 2 to 49% in period 3.

Reliance upon the formalized structure in period 2 had been replaced by a more horizontal system of flows both within and between major elements. Increased utilization of liaison devices such as integrating personnel as well as crossfunctional teams was noted in reviewing project files. This exerts strong pull towards reliance upon standardization of skills to effect integration. The fact that communications still flowed within the hierarchy exerts a counter pull towards formalized processes. These competing pulls draw the organization somewhere between Machine and Professional Bureaucracy.

5.4.3. Table 9.

The majority of meetings still were with external

		Internal	External
Project Engr or Manager Directly Involved	Yes	45	80
	No	14	29

TABLE 9: PERIOD 3 MEASUREMENT OF NED RELIANCE ON MEETINGS.

elements in period 3. (See table 9) However, this had decreased from 85% in period 1 to 65% in period 3. Since only seven projects were studied in period 3, this indicates an increase from 10.6 meetings per project in period 2 to 15.6 in period 3. This is consistent with what one would expect given the increasing demands arising from the public sector described in the analysis of table 8. Interaction by the Project Manager in these meetings increased (inter and external) from 9.2 meetings per project in period 2 to 17.9 in period 3. This was accompanied by an increase in internal coordination meetings by the Project Manager from 1.5 to 6.4 per project.

The remaining 14 internal meetings without the project manager occurred during the design phase of the Charles River Dam Project which was the most technically complex project ever undertaken by NED. This project required an increase in horizontal coordination at the lowest levels.

These trends suggest an increased reliance upon informal project teams achieving coordination through both direct contact (mutual adjustment) and professional abilities. Thus they cause movement towards the lower right of Mintzberg's Pentagon associated with Adhocracy.

5.4.4. Conclusions.

The organization is a Professional Bureau Adhocracy. (See figure 37) This is below that hypothesized in chapter 3. The number of mediating elements increased in this period and interacted less formally with the environment such as interaction of the Project Manager with the public. Inter-major element coordination still retained the period 2 formal managerial paper supported characteristics. This exerts movement towards the left of Mintzberg's Pentagon. However, the shift towards formal nonhierarchical coordination within major elements exerts strong movement to the right of the Pentagon. This was accompanied by reliance upon the professional skills of the lower managerial hierarchy as well as Project Manager controlled *crossfunctional teams*. This latter fact draws the organization downward and to the right of the period 2 position.

5.5. Analysis of Period 4 Integration, (1974-1979).

The structural configuration hypothesized in chapter 3 is an Entrepreneurial Adhocracy. One expects this to be accompanied by coordination through mutual adjustment. This suggests a decentralization of decision making in both the vertical and horizontal directions implying reliance upon the operating core and lower managerial hierarchy to integrate program implementation activities. One expects this to be accompanied by direct managerial

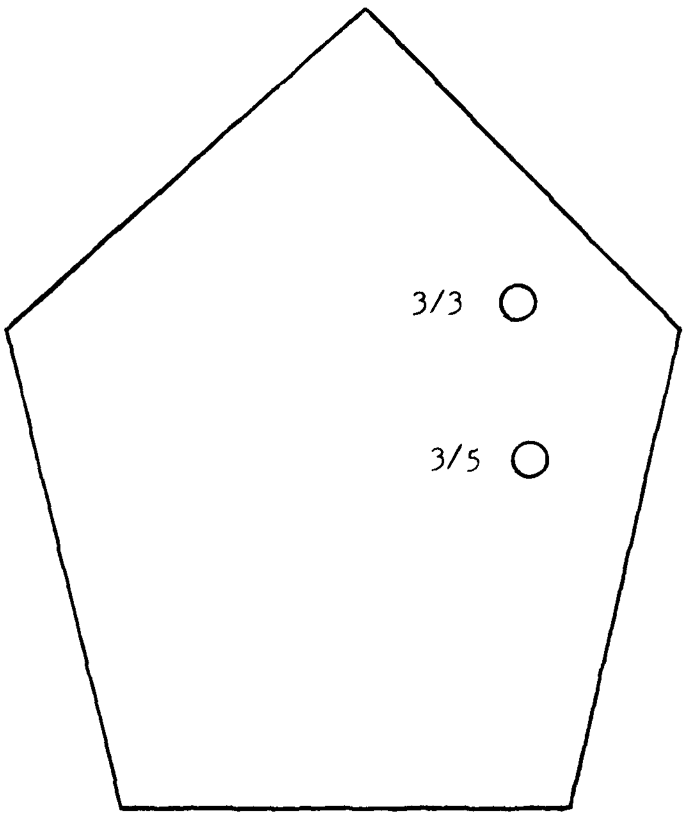

FIGURE 37: PERIOD 3 CLASSIFICATION OF NED BASED UPON ANALYSIS OF FORMAL COORDINATION COMPARED TO THAT HYPOTHESIZED IN CHAPTER 3.

contacts as well as utilization of semi-permanent crossfunctional teams to coordinate work both intra- and inter-major elements.

The program shift to small projects described in section 3.6 should increase interaction between the lower levels of the organization and the external environment, such as Project Managers and Technical Representatives.

5.5.1. Table 10.

Interaction with the environment still is undertaken in period 4 by the Division Engineer and the Chief of the Engineering Division. 98% of all formal coordination with the external environment was accomplished by these two individuals: 86% by the Division Engineer and 12% by the Chief of Engineering. (See table 10) These figures appear to be consistant with the previous period. However, the interaction of the Division Engineer with the environment has become more balanced in period 4 compared to period 3: 36% with agencies, 46% with politicians and 20% with the public compared to 25%, 65% and 10% in these categories in period 3. This shift resulted from intensification of demands arising from all three elements based on intense regulatory and funding constraints impacting on program implementation in period 4.

	Agencies	Politicians	Public
NED Commander	10	13	5
Engineering Division Chief	159	1	37
Project Engr/ Manager	0	1	1
Technical Reps/Other	0	0	2

TABLE 10: PERIOD 4 MEASUREMENT OF WHAT NED ELEMENT INTERFACED WITH THE ENVIRONMENT.

On the other hand, the interaction of the Chief of the Engineering Division has shifted to a less balanced domain in period 4: 81% with agencies, 0% with politicians and 19% with the public compared to 62%, 13% and 35% in these caegories in period 3. This reorientation was a result of increased regulatory requirements stimulating external agency participation during all phases of program implementation. Interaction by the Chief of Engineering with OCE, State Fish and Wildlife and local interest groups consumed a significant portion of his time. This was noted on the New London Hurricane and Smelt Brook projects.

Because of these changes, there appears to be a void with public interaction. This was filled by the Project Managers. A quick glance at table 11 substantiates this.

The intensification and variety of external demands reduced the mediating abilities of the Division Engineer and the Chief of Engineering in this period. They no longer were able to control their period 3 domains in period 4 based on position authority/expertise. The public element demanded technical responsiveness which necessitated bringing the source closer to the interaction.

5.5.2. Table 11.

The bulk of communication in period 4 still flowed within the formal structure (54%) rather than outside hierarchical lines (46%). (See table 11) This breakdown is exactly the same as in period 3. Within the intra-major element category, however, the nonhierarchical flow of communication increased from 58% in period 3 to 73% in period 4. Thus within major elements, reliance on formalized hierarchical coordination flow decreased from 42% to 27% of all documented communication. This resulted in decentralization of actions to branch and section level within major elements. Unlike period 3 where this was confined mostly to small projects, in period 4, this erupted into a full scale method of operation noted during every phase of all projects studied in this period.

Extensive coordination occurred outside the specified hierarchy in period 4. This was observed between the Project Management Branch, Technical Engineering Branch, and Foundations & Materials Branch. Generally, this was initiated at the Project Manager rather than at the Chief of Engineering Division level observed in period 3. Furthermore, the upward communication flow along the formalized organizational structure (42%) was associated with an information process of keeping the boss informed rather than providing him information with which to make a decision.

	Inter-Divisional	Intra-Divisional
Level to Level (Not by Chain-of-Command)	31 / 3	168 / 29
Chain-of-Command	170 / 9	61 / 9

TABLE 11: PERIOD 4 MEASUREMENT OF NED RELIANCE ON FORMAL COMMUNICATION.

There was an increase in documented reference to direct coordination within nonhierarchical major element coordinations increasing from 46% in period 3 to 76% in period 4. This indicates that in addition to coordinating horizontally at the lower levels, these activities were accomplished through personal contact or phone calls. Hence reliance upon direct managerial interfaces as a liaison device increased tremendously. These facts suggest a strong reliance upon mutual adjustment to effect coordination within (intra) major elements.

Between major elements, a reverse trend towards more reliance upon formalized hierarchical coordination to integrate activities was observed in period 4. This increased from 63% of all inter-major element communication in period 3 to 85% in period 4. In addition, this inter-major element formalized flow was coupled with a decreased reference to coordination previously effected through direct contacts. In the few cases it was accomplished by direct contacts, it generally was between the Engineering Division Project Managers and the Construction Division Project Engineers as noted on the Charles River Dam Project. These facts suggest that inter-major element coordination relied primarily upon standardization of outputs indicated by reliance upon integrating personnel and the managerial hierarchy.

Thus the organization was drawn to the lower right of Mintzberg's Pentagon. Yet inter-major element trends exert a weak pull towards the left of Mintzberg's Pentagon through standardization of products during construction.

5.5.3. Table 12.

The majority of meetings in period 4 were external (75%) and involved the Project Manager (84%). This is an increase in each category from period 3. (See table 12) Coupled with the few internal meetings without the Project Manager present, one can see that reliance upon crossfunctional teams was a major method of effecting coordination in period 4. This is substantiated by the fact that 4 of the 7 external meetings without the Project Manager being present occurred between technical representatives and agencies on the Charles River Dam project at the direct request of the Project Manager. Thus as previously described, the Project Manager was a viable mediating element. Furthermore, one can see that his role in the decentralized integration of activities had increased substantiating reliance upon coordination through mutual adjustment.

5.5.4. Conclusions.

		Internal	External
Project Engr or Manager Directly Involved	Yes	13	39
	No	3	7

TABLE 12: PERIOD 4 MEASUREMENT OF NED RELIANCE ON MEETINGS.

The organization is an Adhocratic Machine Bureaucracy. (See figure 38) This is below that hypothesized in chapter 3. The traditional mediating elements (Division Engineer and Chief of Engineering) lost their control over the environment especially in the public sector necessitating increased reliance upon Project Managers. This draws the organization to the lower right of Mintzberg's Pentagon.

Nonhierarchical coordination increased within major elements and was accompanied by increased utilization of direct managerial to Project Manager contacts. This also draws the organization to the lower right of the Pentagon.

The increased inter-major element formalized flows with its accompanying direct managerial contacts at the upper levels observed in NED during this period is characteristic of the coordination between separate elements of the Machine Bureaucracy. This was strengthened by the tactcit hierarchical approval required to effect inter-major element coordination.

Thus in period 4, coordination was achieved through decentralized intra-major element mutual adjustment with managerial hierarchical support between major elements.

5.6. Analysis of Period 5 Integration, (1980-1984).

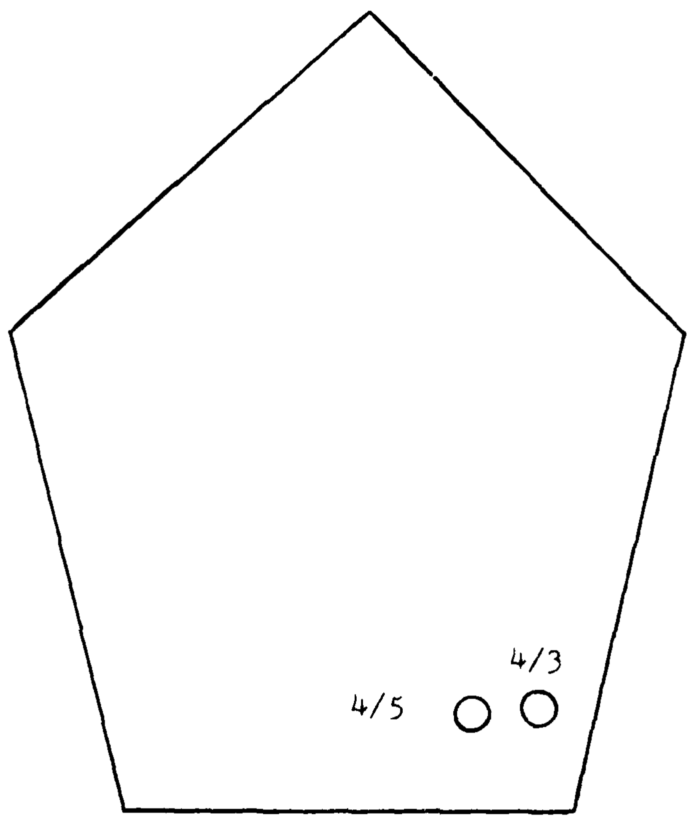

FIGURE 38: PERIOD 4 CLASSIFICATION OF NED BASED UPON ANALYSIS OF FORMAL COORDINATION COMPARED TO THAT HYPOTHESIZED IN CHAPTER 3.

The configuration hypothesized for this period in section 3.7 is an Entrepreneurial Adhocracy. One expects this to be accompanied by standardization of flows between major elements and reliance upon mutual adjustment founded upon professional skills within major elements. This should be accompanied by extensive intra-element decentralization both horizontally and vertically to accomplish inter-major element coordination. Lastly, one expects to see the mediating mechanisms solidify their domains once again. However, the trend towards increased interaction by Project Managers with the public should continue.

5.6.1. Table 13.

Interaction with the environment was formally accomplished by both the Chief of Engineering (76%) and the Division Engineer (24%) in period 5. (See table 13) The significant decrease in overall environmental demands arising from both the public and political sector from period 4 to period 5 suggests two possibilities. The intense regulatory requirements have either stiffled political/public interests during the planning and design phase or the agencies were spokesmen inserting the most representation and incisive demands upon NED. In either case, the demands arising in period 5 generally were from

	Agencies	Politicians	Public
NED Commander	11	0	3
Engineering Division Chief	44	0	1
Project Engr/ Manager	0	0	0
Technical Reps/Other	0	0	0

TABLE 13: PERIOD 5 MEASUREMENT OF WHAT NED ELEMENT INTERFACED WITH THE ENVIRONMENT.

the agency category.

The Project Manager in period 5 increased his interactions with the local public and politicians through external coordination meetings. This is substantiated by a significant reduction in the interactions of the Division Engineer and Chief of Engineering with these elements.

5.6.2. Table 14.

The majority of formal communications in period 5 still flowed within formal hierarchical channels (57%) rather than outside them (43%). (See table 14) This is similar to the 56%/44% of period 4. Within the intra-major element category however, the nonhierarchical flow decreased from 73% in period 4 to 65% in period 5. Thus within major elements, reliance upon formalized hierarchical coordination increased from 27% to 35%. This is a tremendous shift back towards period 3 levels. However, this figure is misleading since over half of these intra-major element hierarchical flows were information memos forwarded through channels to apprise upper level managers of suspense dates imposed on their personnel by the crossfuctional team chiefs (Project Managers). These actions occurred more prominently on small projects such as North Hartland and Islesborro where

	Inter-Divisional	Intra-Divisional
Level to Level (Not by Chain-of-Command)	3 / 1	104 / 22
Chain-of-Command	87 / 8	57 / 5

TABLE 14: PERIOD 5 MEASUREMENT OF NED RELIANCE ON FORMAL COMMUNICATION.

fund ceiling constraints were absolute. This type of flow served as a double check action on the upward communication flow resulting from the matrix project team structures utilized in both the Planning and Engineering Divisions. Thus in reality, a truely adhocratic structure reliant upon mutual adjustment existed. This was manifested by the tremendous cross level coordination between Project Managers and all other Technical Branch/Section Chiefs.

The reference to direct coordination in intra-major element correspondence increased from 76% in period 4 to 81% in period 5. This also suggests coordination through direct contacts either at the managerial level or the operating core team member level. These facts exert strong movement towards the lower right of Mintzberg's Pentagon.

Reliance upon formalized hierarchical coordination between elements increased from 85% in period 4 to 97% in period 5. During period 5, NED implemented a formalized Project Management Regulation which will be more fully addressed in chapter 6. The effect it had here was to increase flows between major elements. Although crossfunctional teams involved inter-major element personnel, this did not increase the upward flow between elements. It had the opposite effect which was to

reinforce formality in the inter-major element coordination. This exerts a very strong counter move towards the upper left of Mintzberg's Pentagon, suggesting that inter-major element coordination was effected by standardized flows initiated at the Project Manager level.

The organization of period 5 was drawn towards extremely decentralized operations within major elements by a formalized Project Management Regulation. Yet, its formality initiated by-products which resulted in increased inter-divisional formalization. This may be a function of claims to domain, policy or precedent. In any case, it is pulled between two opposing poles of Mintzberg's Pentagon.

5.6.3. Analysis of Table 15.

The trend towards reliance upon Project Managers in period 4 continued in period 5. 90% of all meetings involved the Project Manager in period 5 while the percentages of external and internal meetings remained constant. The number of meetings per project in period 5 of 7.3 is comparable to 8.8 in period 4. Project Manager interaction with the public and agency elements of the external environment continued. The overall increase in Project Manager meetings coupled with increased mediating activities of PM's within and between major elements noted

Project Engr or Manager Directly Involved		Internal	External
	Yes	6	13
	No	0	2

TABLE 15: PERIOD 5 MEASUREMENT OF NED RELIANCE ON MEETINGS.

in the project files substantiates that the internal movement of NED was towards decentralized matrix operations.

5.6.4. Conclusions.

The organization is an Entrepreneurial Adhocracy. (See figure 39) This is below and to the right of that hypothesized in chapter 3. The mediating mechanisms appear to have resolidified their domains yet the presence of the Project Manager interacting with the public increased over that observed in period 4. This draws the organization slightly to the lower right of Mintzberg's Pentagon.

The standardized flows observed between major elements in period 4 increased in this period possibly due to a stabilization of the environment. Yet, within many elements, an increased decentralization of activity implementation was observed especially with the formalized Project Management Regulation. This established strong upward flows. However, this formalized procedure also increased formality of processes between major elements which increased centralization, thereby limiting the domain of Project Managers on inter-major element coordination. These facts exert pulls upward and to the

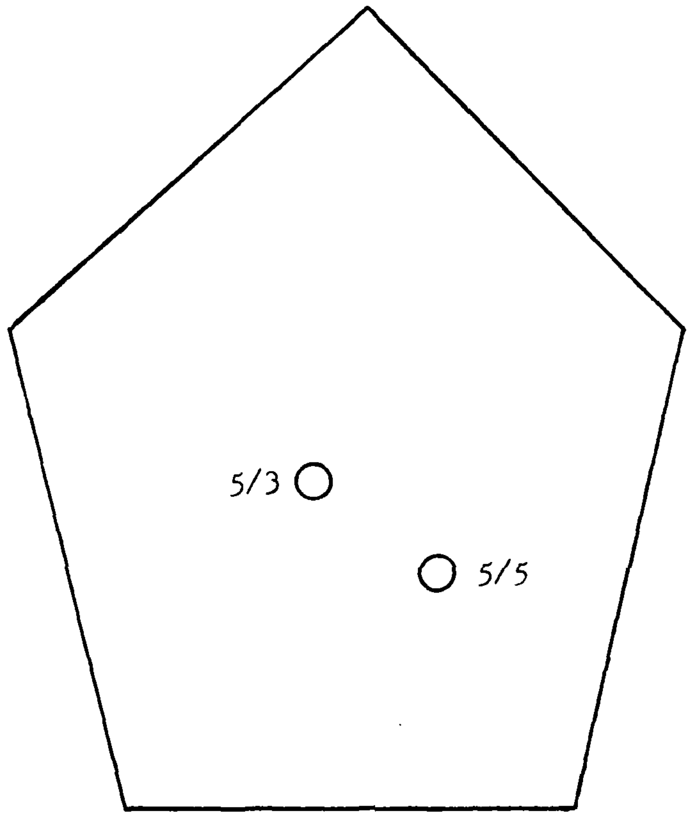

FIGURE 39: PERIOD 5 CLASSIFICATION OF NED BASED UPON ANALYSIS OF FORMAL COORDINATION COMPARED TO THAT HYPOTHESIZED IN CHAPTER 3.

left from the period 4 position due to this dependence upon formalized coordination between major elements which constrains the matrix structure through a shift back to a more structured paper system. Thus the organization achieves integration of activities through internally decentralized activities within major elements bound by an increased formality between major elements resulting from hierarchical supported flows serving as approval agencies in a supposedly "formalized" matrix structure.

5.7. Summary.

This chapter conducted an analysis of NED on the dimension of formal integration of program activities. This was accomplished through a review of project files along three subdimensions: interaction with the external environment, reliance upon formal liaison devices and reliance upon informal liaison devices. Supplemented with details from project files, this data enabled identification of the integration mechanism(s) utilized to coordinate program activities both within and between NED major elements. This enabled classification of the organization of each period.

This analysis provides an alternative perspective to those achieved in chapters 3 and 4. Rather than concentrate on organization structure versus programs, the

focus in chapter 5 is on coordination versus programs.

6. ANALYSIS UTILIZING SEMI-STRUCTURED INTERVIEWS.

The objective of this chapter is to classify the organization of each period along the dimensions of informal integration and associated liaison devices. This is accomplished through detailed semi-structured interviews with key informants. The hypothesized organization structures of chapter 3 will serve as a basis of comparison.

6.1. Methodological Overview.

In order to accomplish the objectives of this chapter, three critical problems had to be addressed: development of a suitable interview technique, identification of the interviewees, and elimination of interviewee subjectivity as much as possible from the analysis. The writings of Lawrence and Lorsch (28), Meyer (33), and Miller and Friesen (37) were drawn upon in this development in whole or in part and will not be referenced further.

6.1.1. Interview Technique.

The interviews were semi-structured consisting of two phases. In the first phase, the respondent was given an overview of the thesis objectives similar to the outline

of section 1.6. The second phase consisted of a verbal presentation of the findings by period described in chapter 3. The interviewee was then asked to comment and expand on four items which might lead to further researcher questions: how coordination was effected within the major element(s) in which he was a member, how coordination between major elements was effected, how the organizational changes occurred, and what factors either internal or external to NED influenced this process.

6.1.2. Selection of Respondents.

Since the period of study covered 28 years, it was decided to focus interviews on personnel with 10 years or more experience in NED. Only one individual interviewed did not meet this criteria, the current Chief of the Engineering Division. His selection was based upon his upper middle line managerial position.

The identification of major elements from which to select respondents became critical. The major activities involved in civil works programs are the Planning, Engineering and Construction Divisions. In addition, peripheral activities performed by the Programs Office, Comptroller and Public Affairs Office had impacted upon civil works programs during some portion of the study period. Hence, interviewees were selected from all six of

these major elements.

The last decision was who to interview. This was accomplished by focusing upon both the managerial hierarchy and project managers within subelements. Utilizing the 10 year criteria and attempting to get an appropriate mix of technicians, technical managers and project managers, 17 personnel were interviewed: 6 from the Engineering Division, 4 from the Planning Division, 4 from the Construction Division, 1 from Office of the Comptroller, 1 from the Programs Office, and 1 from the Public Affairs Office. (See bibliography under interviews)

6.1.3. Controlling Respondent Bias.

In order to prevent respondent biases from adversely affecting research findings, two issues had to be dealt with: accuracy of interviewee recall and insertion of individual biases in their responses. These two factors clearly could be intertwined compounding errors. In order to control for these two factors, responses to interviews were considered suspect unless verified by two other respondents. Although this approach appears somewhat arbitrary, requiring three independent respondents to corroborate facts provide some measure of control. Situations did arise where uncorroborated evidence of great significance was presented. These were pursued

through second interviews for verification.

6.1.4. Controlling Researcher Bias.

The inclusion and/or elimination of relevant data is a major source of error in this type of longitudinal analysis. Attempts have been made to guard against it in this chapter. Yet, the arbitrariness of the three person verification rule could be too stringent, thereby unnecessarily excluding unbiased facts from inclusion in the analysis. Thus one can consider the approach a double edged sword which is a "best shot" methodological approach.

6.1.5. Anonymity of Respondents.

Reference to respondents will be accomplished only in the broadest sense. Identification by name, position, or major element will not be done in documenting references in order to protect interviewee anonymity.

Unlike chapter 5, reference to the hypothesized findings of chapter 3 will not be accomplished within each period analysis. This information is available from the first paragraph of sections 5.2 through 5.6 for each period. The reader can refer to these as necessary.

6.2. Analysis of period 1, (1955-1961).

Thirteen of the interviewees characterized the environment of period 1 as stable and consistent in its demands upon NED. The major factors arising from all three sectors of the environment (political, public, and agencies) were demands for effective programs implemented as expeditiously as possible.

6.2.1. Mediating Elements.

Respondents identified two mediating elements within NED who interacted with environment: the Division Engineer and the Chief of the Engineering Division. The Division Engineer formally interacted with all political demands and was NED's visible interface with the environment. However, the interviewees pointed out that there was a significant amount of interaction occuring informally between the Chief of Engineering and political elements. These interactions generally occurred through phone calls or meetings, and they usually were of a specific nature of more immediate impact on projects such as real estate rights of way or land acquisition problems. These respondents also pointed out that the Chief of Engineering was a dynamic leader who drew upon his professional capabilities as an engineer as well as his position to establish himself as the focal point of interaction with

agencies and the public. He accomplished these tasks personally or utilized Project Engineers to effect on-the-ground coordination as he directed.

6.2.2. Project Engineers.

The planning and design phases of program implementation were performed by elements of the Engineering Division. This was accomplished through reliance upon Project Engineers and permanent multi-discipline teams. Although the organizational charts and projects files do not clearly indicate the presence of these elements during period 1, twelve respondents adamantly described the operations of the Project Engineers during this period of explosive growth. Three of these interviewees were members of these teams during period 1.

Program implementation was accomplished through Project Engineer Teams within the Engineering Division. These teams consisted of a Project Engineer, an Assistant and up to five members. All of these individuals were registered professional engineers. Selection as a Project Engineer was made by the Chief of Engineering himself and was based upon experience (usually 10 years) and demonstrated professional competence. Thus the P.E. earned his position by earning the respect of the Chief of

Engineering. He was then promoted out of the technical elements. The other team members likewise were selected based upon exceptional performance. In this manner, the Chief of Engineering was able to insert his standards into program implementation by grooming his managing engineers.

The Project Engineer Teams were organized along river basin lines and thus were oriented towards specific geographical localities undertaking all programs within the basin. These teams acted as a program nucleus by implementing projects from feasibilty studies through general designs. They effected this by drawing upon their own assets or coordinating with technical elements for support. Once a project was funded for construction, the Project Engineer and his team interacted very informally with other technical elements to complete the necessary feature designs. This was generally accomplished Project Engineer to Branch or Section Chief. However, after initial contacts were made, it was not uncommon for extensive undocumented coordination to occur at the operating core level.

The Project Engineer was responsible to the Chief of the Engineer Division directly. This gave him considerable autonomy of action. This method of program implementation is characteristic of the Divisionalized Form with its reliance upon standardization of outputs

utilizing integrating personnel to coordinate inter-element activities.

However, respondents also indicated that the Project Engineer had to adhere to formalities of hierarchical coordination for support. This process retained overtones of the Machine Bureaucracy.

The success of this method of program implementation was contingent upon several factors. The Project Engineer was a general engineer with extensive experience based upon training in the 1930's and 1940's. This ability was developed from the abundance of military program projects which relied upon reasonable judgement in site adaptation of proven designs. The civil works program of period 1 was similar in this regard since it involved construction of earthen dams which lent themselves to a minicustomization or site adaptation. Coupled with thses factors was an external demand for NED to solve problems. Focus was on engineering solutions. Thus the Project Engineer focused on doing work. This necessitated reliance upon direct contacts instead of writing memos. He relied upon his notebook to document his coordination activities. Often this served as his proof of action when questioned by the Chief of Engineering. This rapport between superior and subordinate was an outgrowth of mutual respect and professionalism characterizing this

method of operation. Only in critical situations would the P.E. follow a change order with a memo. This concept of management was consistent with an action oriented agency faced with relatively few programs which allowed for consistency of schedules and development of personal contacts. Thus the focus on major programs enhanced reliance upon the professional skills, promoted comradery and personal contacts.

6.2.3. Area Offices.

During the construction phase, the decentralized coordination between the Area Engineer and the Engineering Division Project Engineer continued. Conflict resolution occurred through personal contacts at the operating core level.

6.2.4. Conclusions.

Based upon this analysis, the organization of period 1 is drawn downward and slightly to the right of that hypothesized in chapter 3. This is due to the extensive reliance upon permanent geographically based multi-discipline teams to effect integration. These characteristics display movement towards coordination by mutual adjustment to ensure standard products occurred. Although standardized flows did exist, the overall

implementation of programs was adhoc. Thus the organization is classified as a Divisionalized Adhocracy shown in figure 40.

6.3. Analysis of Period 2, (1962-1968).

The interaction with the environment during this period remained basically consistent with that of period 1. The overall characterization by interviewees was that of manageable growth.

6.3.1. Mediating Elements.

Although demands for accountability arose within both the public and political areas, the consolidated power base amassed by the Chief of Engineering in period 1 enabled him to effectively interact with all demands in period 2. These respondents consistently pointed out that during this period, the Chief of Engineering solidified his position within NED and was elevated to the Strategic Apex level where he performed as an informal Assistant Division Engineer.

6.3.2. Project Engineers.

The decentralized program implementation procedures established in period 1 continued within the Engineering

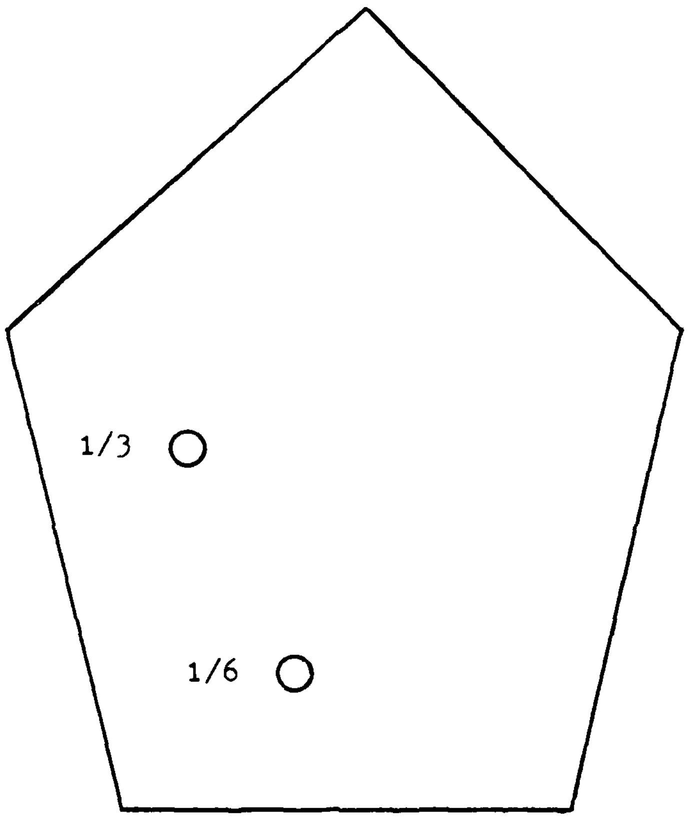

FIGURE 40: PERIOD 1 CLASSIFICATION OF NED BASED UPON ANALYSIS OF INFORMAL COORDINATION COMPARED TO THAT HYPOTHESIZED IN CHAPTER 3.

Division during the first half of period 2. By 1966, however, NED was feeling the impact of two elements in the environment which impacted upon this concept: Viet Nam and retirement of the professional engineers who were the products of the 1930's and 1940's.

The Viet Nam war drew several critical personnel away from NED to West Coast Corps offices. This was especially significant in the Planning and Reports Branch which at this time was increasing in importance within NED. Although the total losses were less than 15 people, it reduced the pool of experience which was further being reduced through personnel reductions resulting from the declining civil works program of NED as described in section 3.4.

Starting in 1967 and continuing for the next six years, retirements of experienced personnel increased as eligible individuals within the Engineering and Construction Divisions left NED. The decline in program spectrum coupled with the emergence of the regulatory requirements under the 1965 Water Quality Act were identified by respondents as major factors. These losses were not overly significant in themselves, but they were omens of events to come.

In the fall of 1966, program implementation within NED

was drastically altered. The Project Engineer permanent multi-discipline teams were disbanded and the Project Management Branch emerged within the Engineering Division. Respondents cited three factors for this shift: reorientation from an action agency, loss of the professional general project engineer, and emergence of public accountability focusing on management.

As NED reached the mid 1960's, the environmental demands for action of period 1 had been satisfied. Public outcry for action declined at a time concerns for accountability of resource expenditures were increasing. Thus the action engineer of period 1 was fast becoming an obselecence in period 2. Consolidation of activities occurred within NED described in section 4.4. This was compounded by a loss of the most experienced personnel, especially Project Engineers. In addition, internal technical personnel resources were reduced. Thus coordination for resources became more competitive. Since the Divisionalized Form Project Management of period 1 was dependent upon a vast pool of technical experts within the Engineering Division, the reduction of this pool in period 2 rendered that system ineffective.

The Project Management Branch was comprised of general engineers who performed as engineer/facilitators. Project Managers no longer controlled basin organized permanent

teams characteristic of the Divisionalized Form. The Project Manager still was assigned a basin but he now drew upon the technical elements for total support. This increased his interaction with Branch/Section Chiefs in comparison to period 1. Thus the emergence of project flows occurred and program implementation shifted towards a process of flows within the planning and design phases undertaken within the Engineering Division. This necessitated standardization of process to effect coordination.

Interviewees substantiated that direct supervision by the Chief of Engineering and Branch Chiefs occurred more in period 2 than period 1. This was accompanied by emergence of a stronger middle line as the autonomous power of the period 1 Project Engineer shifted to the managerial hierarchy who conrolled the reduced supply of assets. These factors suggest a move to the upper left of Mintzberg's Pentagon from the period 1 position.

6.3.3. Conclusions.

The organization of period 2 is drawn upward from period 1 to that shown in figure 41. This is below and to the left of that hypothesized in chapter 3. This resulted from an increased dependence on standardization of processes as evidenced by the emergence of the middle

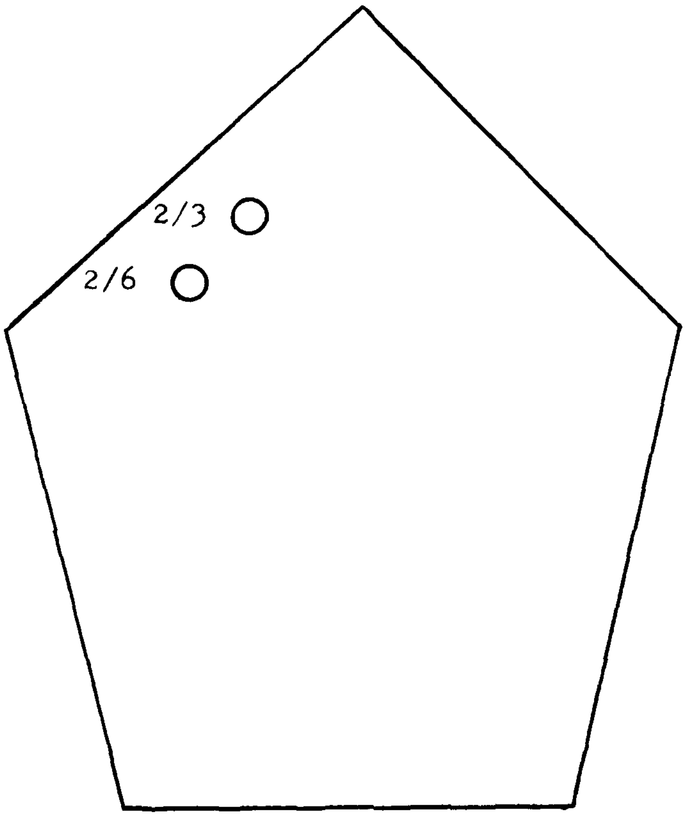

FIGURE 41: PERIOD 2 CLASSIFICATION OF NED BASED UPON ANALYSIS OF INFORMAL COORDINATION COMPARED TO THAT HYPOTHESIZED IN CHAPTER 3.

line. This is accompanied by increased reliance upon the managerial hierarchy and even direct supervision to effect integration. However, the continued utilization of Project Managers to integrate activities exerts a weak pull towards the right and lower right of the Pentagon. The organization is classified as a Simplest Bureaucracy.

6.4. Analysis of Period 3, (1969-1973).

The environment of this period was identified by respondents as moderately complex and increasingly hostile.

6.4.1. Mediating Elements.

The initial imposition of regulatory requirements under NEPA were being felt which caused fluctuating program priorities and increased interference from external demands. This resulted from a degredation of the mediating capabilities of the Division Engineer and the Chief of Engineering. The volume projects prohibited individual control of external demands. Within the planning and design phases, this translated into a fivefold increase in Project Manager interaction with the environment.

This increase in Project Manager mediating activities

was a function of the shift to increased program dependence upon small projects as well as increased emphasis on comprehensive planning. This type of program composition increased the number of projects and project managers, thereby increasing competition for decreasing technical support resources. This increased the coordination efforts of the Project Managers.

6.4.2. Project Management.

Program implementation in period 3 was still reliant upon informal Project Management teams and the managerial hierarchy. Consolidation of activities especially within the Engineering and Construction Divisions continued. This was accomplished through personnel reductions described in section 4.4.

In 1972-1973, a large number of experienced personnel within both these elements were offered inducements to retirement. Coupled with the declining civil works mission and insertion of regulatory constraints on programs, this provided adequate incentive. The repercussions of this action in light of the program shift to small projects and loss of the military mission was significant. The pool of action engineers trained to implement programs by the dynamic Chief of Engineering was drastically reduced. The replacement personnel especially

in Project Management were inexperienced and management rather than engineering oriented. These losses coincided with external demands for increased program accountability. In this shift to management implementation, a valuable resource was being depleted.

The shift to small projects removed the large complex and intricate engineering/management challenges which developed the professional skills of the Project Engineers. Coupled with the loss of this cadre, NED lost its military construction program. This also had served in the past as a training tool as well as a mainstay for Project Engineer/Project Manager development during periods of decreased civil works activity. It had provided moderate engineering challenges with extreme demands upon management coordination activities. In addition, it had been instrumental in the development of site adaptation abilities of engineers providing training on how to make reasonable judgements.

Thus the general approach to program implementation still retained its decentralized concept, except now the strength of the lower level managerial hierarchy as well as the capabilities of the Project Managers was greatly reduced. This resulted in degradation of project flows as traditional power bases eroded. A new order emerged and program success depended upon Project Manager/Technical

Supervisor ingenuity. This increased reliance upon direct contacts by integrating personnel in addition to formal flows.

6.4.3. Conclusions.

The organization is a Simple Professional Bureaucracy. (See figure 42) This is below and to the left of that hypothesized in chapter 3. This resulted from environmental demands for increased accountability coupled with a decline in NED personnel. Although the organization suffered a loss of experienced personnel, the shift to a management orientation demanded increased professionalization of its work force. This causes decentralization of activities horizontally increasing dependence upon Project Management to effect coordination.

6.5. Analysis of Period 4, (1974-1979).

The environment of period 4 was characterized by respondents as the most complex and uncertain in NED history. This was attributed to two factors: peak intensification of demands under NEPA and tight money.

6.5.1. Mediating Elements.

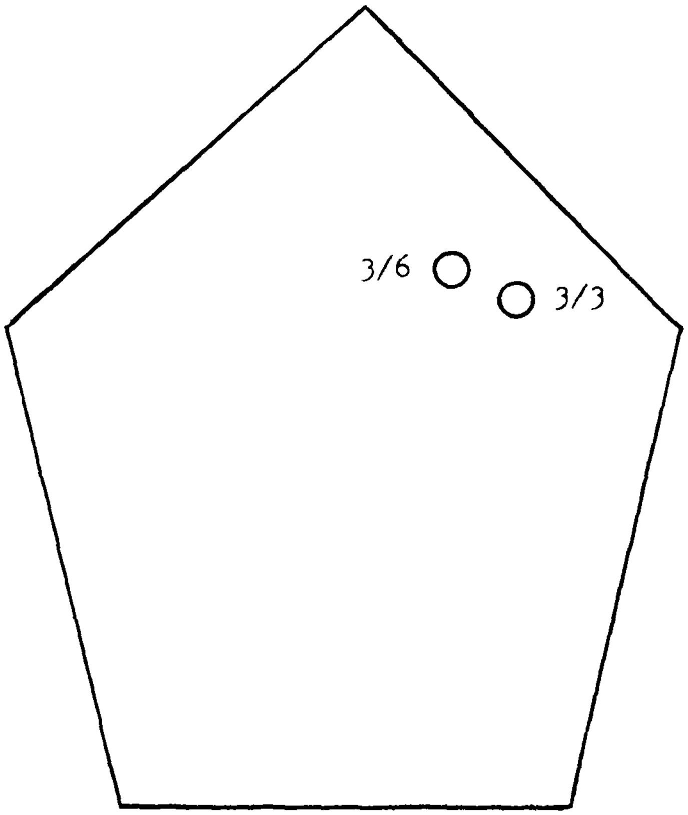

FIGURE 42: PERIOD 3 CLASSIFICATION OF NED BASED UPON ANALYSIS OF INFORMAL COORDINATION COMPARED TO THAT HYPOTHESIZED IN CHAPTER 3.

The effects of NEPA increased in intensity during period 4 focusing internal NED activities on comprehensive alternative planning. In February 1974, this resulted in the separation of the Planning & Reports Branch and Programs Office from the Engineering Division.

The immediate impact of this reorganization was two fold. First, it reduced the environmental boundary spanning activities of the Chief of the Engineering Division since he no longer was responsible for program implementation through completed design. This increased the number of elements who interacted with the environmemnt. Secondly, it decentralized operations, further increasing reliance upon crossfunctional teams. This resulted because coordination during the planning and design phases necessitated coordination across more major element boundaries than previously. As a result, the Project Manager was forced to become more dependent upon the managerial hierarchy for coordinating his support. Thus, the Project Manager was thrust more to the forefront requiring him to interact both as a boundary spanning element with the environment and as a facilitator within NED.

6.5.2. Project Management.

The shift towards reliance upon small projects peaked

in this period. (See section 3.7) The civil works program composition was varied bordering on unpredictable. These projects imposed absolute funding ceilings during a time of increased volume of small projects each possessing a short implementation cycle. This increased internal competition for reduced resources resulting from continuing personnel reductions especially in the Planning and Engineering Divisions. In 1976, the dynamic Chief of Engineering retired. A redistribution of power within NED followed. This produced an emphasis on management implementation of programs by Project Managers at the expense of engineer/management implementation characteristic of periods 1 and 2.

This shift increased reliance upon informal matrix structures. The Project Manager became the focal point for all coordination under this concept. This increased dependence on the skills of the PM. However, respondents noted that in period 4, the expertise of the Project Managers was at it lowest point during the 28 year period of this study. This could be traced to the loss of the military construction mission and the decrease in major civil works programs as cited in section 6.4. One would expect this to increase reliance upon direct contacts to coordinate activities, but the opposite occurred.

The high intensity environment coupled with reduced

Project Manager experience increased reliance on coordination through memos (paper system). This was more prominent on inter-major element coordination. As one respondent stated, " If a little old lady in tennis shoes did not stop us under NEPA, our own inexperience and cumbersomeness would bog us down." In 1979, the NED civil works program reached its low point.

6.5.3. Conclusions.

The organization is a Simplest Entrepreneurial Adhocracy. (See figure 43) This configuration is above and to the left of that hypothesized in chapter 3. The environment reaches its peak intensity exerting equal and opposite pulls for coordination through standardization of processes and coordination through mutual adjustment. The complexity of the program spectrum forced further decentralization of activity integration to informal project teams. However, this was thwarted by the inordinate control wielded by the managerial hierarchy at the branch and section levels in utilizing personnel assets. This inserts formality into the adhoc process by coordination through the chain of command. This detracts from project manager effectiveness since it forced coordination through memos. This prevented the organization from being an effective Adhocracy drawing it up and to the left of the pure configuration.

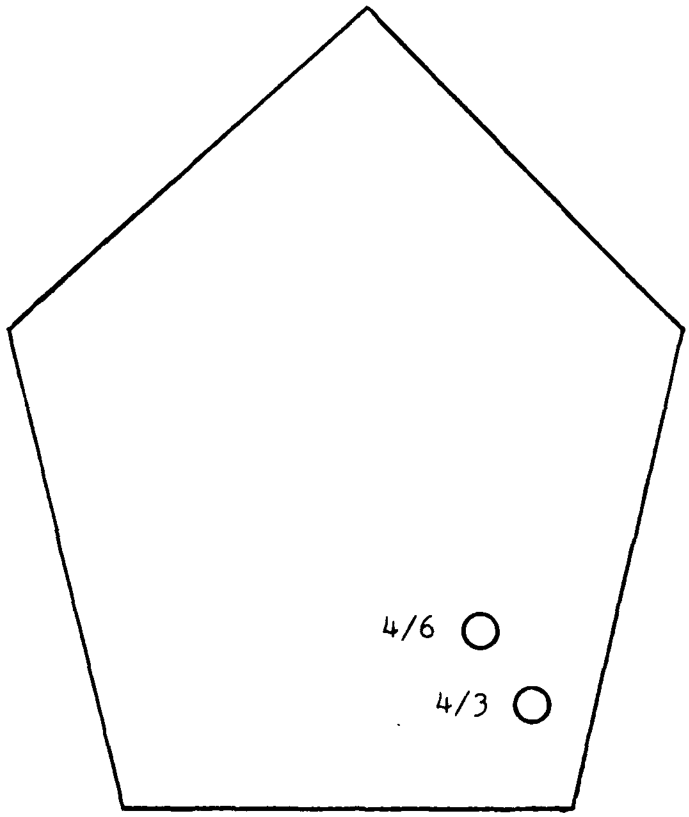

FIGURE 43: PERIOD 4 CLASSIFICATION OF NED BASED UPON ANALYSIS OF INFORMAL COORDINATION COMPARED TO THAT HYPOTHESIZED IN CHAPTER 3.

6.6. Analysis of Period 5, (1980-1983).

Respondents indicated that by 1980, external demands on NED arising from NEPA, funding constraints and constituents impacted less on program implementation. The mediating elements were able to solidify their positions enabling them to interact more effectively with the external environment.

6.6.1. Project Management.

The major change in this period was the shift to a formalized Project Management procedure addressed in section 5.6. The intent of this regulation was to reduce NED overhead in the planning and design phases of program implementation which was initiated during period 4. (See sections 3.5 and 3.6) This was to be accomplished by formalizing a decentralized matrix method of program implementation which relied upon Project Managers and team members to initiate and control the flow of programs as they traversed through to construction. The shift to this method of management was consistent with the external demands which drove the environment to the upper right of figure 14.

This informal project management concept of period 4

was dependent upon project manager and lower middle line managerial hierarchy cooperation (branch and section chief). However, as several respondents noted, it encountered strong resistance, which often thwarted the integration efforts of Project Managers. This occurred because the managerial hierarchy controlled the assignment of assets and thus could withhold/shuffle support to project managers based on project manager adherence to the formality of managers' domains, procedures or protocol.

In November 1979, NED formalized Project Management in an NED Regulation. This regulation served two distinct purposes. First, it established the concept of decentralized program implementation based upon joint participation/integration by the Project Manager and team members. Second, it served as a basis of power for Project Managers to obtain support from the managerial hierarchy which was lacking in period 4.

6.6.2. Formal Flows.

By decentralizing operations formally, NED established a system of upward flows in which the Project Manager became the focal point for program implementation. The team members became the point of contact within their elements for specific activity support such as geotechnical design. These crossfunctional teams not only

integrated activities within but also between major elements. All members were assigned by order of the Division Engineer (NED Commander) and could only be removed by his written order. Thus program implementation with a technical element occurred as team members worked with their project manager. Now the section/branch chief had to obtain his element workload from his personnel who were often multiple team members. This decreased his technical duties and increased his management duties. In this manner, he became dependent upon his subordinates to keep him informed.

This shift also reduced the engineering responsibilities of the Project Manager since program concepts, scheduling and other input was now generated by the team members. Coupled with this formalized system was an increased need for upward program information flow (reports) to keep the managerial hierarchy appraised of progress on projects. This increased the administrative workload of both the project manager and the team members who had to generate these reports. The team members inputted their information to the PM who in turn generated the feeder reports. This system, which was more dependent upon coordination, was also susceptible to more errors and omissions. As a result, Project Manager use of formal memos increased to ensure that elements were "informed" of coordination/support actions at the expense of decreased

direct contacts. This shift towards reliance upon a paper system is contrary to the nature of matrix management exerting a counter move towards coordination through standardized flows characteristic of the Machine Bureaucracy.

6.6.3. Direct Supervision.

Coincident with the matrix system, NED implementd the use of formal Project Review Boards (PRB) in 1980. These served to elevate problems directly to the Division Engineer and upper middle line managers without reliance upon memos. This generally occurred to in order to slip schedule dates or change direction in a program in the planning or design phase. This enabled the team to input information directly to those who would make the decision. This method of direct contact with the managerial hierarchy is consistent with coordination by mutual adjustment characteristic of the Adhocracy. However, several respondents noted that at times these PRB's were used to update the chain-of-command or served to draw decision making upward inappropriately. This latter fact occurred by diluting responsibility for decisions upward from project managers. In this manner, the PRB inserted coordination by direct supervision into the program flow. This draws the organization upward towards the top of Mintzberg's Pentagon.

6.6.4. Increased Meetings.

The formal project management process was credited with cutting down delays due through identification of points of contact. In addition, it clearly increased the status of the Project Manager relative to the branch and section chiefs. This arose from support of the matrix system by the Division Engineer. This raised the Project Manager on a level with the Project Engineers of period 2, thereby rectifying the apparent disparity between position authority of PM's and Branch/Section Chiefs observed in period 3 and 4. This enabled better cost controls by the Project Manager but also increased his need for internal project team meetings.

6.6.5. Increased Coordination.

Because of the formal nature of this project management system and the inexperience of Project Managers in period 5, the interaction between them and the managerial hierarchy also increased. This was attributed to the accountability of the managerial hierarchy to the Division Engineer for the success of their team members on program implementation. The multiple team member assignments of individuals and the high volume of small projects resulted in a dual boss structure at the operating core level.

Since team members were evaluated by their Technical Element Chiefs and not the Project Manager, the Division Engineer had to hold the element chiefs accountable for program success. Since this is inconsistent with the upward information and program flow of the matrix structure, the managerial hierarchy of necessity had to interact with the Project Manager. This interaction increased as program scheduling conflict increased. Thus problem resolution/coordination between the PM and the managerial hierarchy increased. This resulted in the establishment of a system of flows which exerts a move back towards standardization of processes.

6.6.6. Conclusions.

The organization of period 5 is an Entrepreneurial Adhocracy. (See figure 44) This is below and to the right of that hypothesized in chapter 3. This resulted from the significant reliance upon crossfunctional project teams to integrate activities. However, the formalization of the Project Management process draws the organization upward to the left of its period 4 position. Although the formalized process did increase the effectiveness of the Project Manager, it also increased the interaction of the managerial hierarchy. This regulation serves more to establish a system of flows in program implementation than decentralization of activities as it was intended. Its

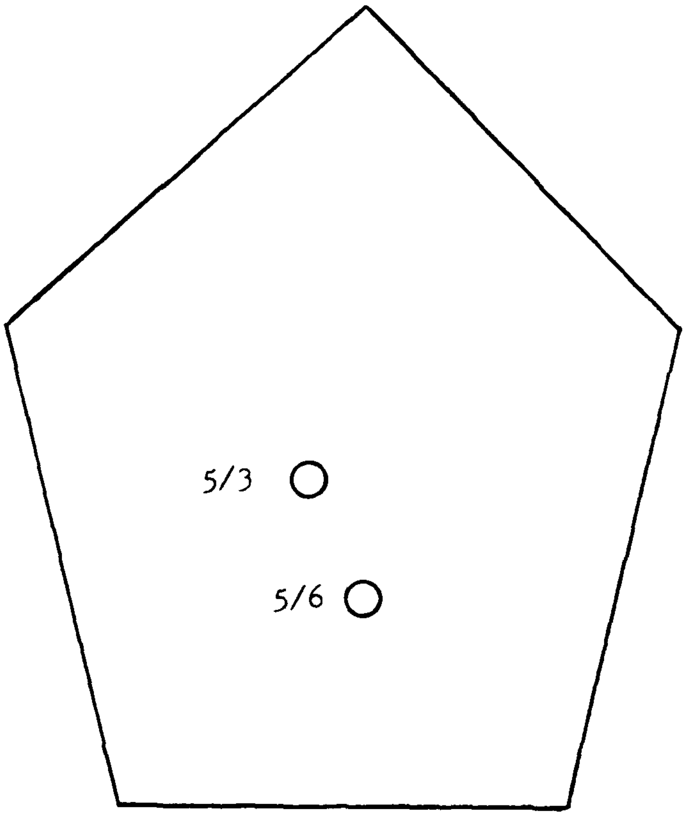

FIGURE 44: PERIOD 5 CLASSIFICATION OF NED BASED UPON ANALYSIS OF INFORMAL COORDINATION COMPARED TO THAT HYPOTHESIZED IN CHAPTER 3.

reliance upon professional skills of the team members also draws the organization upward. This truly matrix program implementation concept was constrained by its own formality thereby pulling the organization upward and slightly to the left of the previous period.

6.7. Summary.

This chapter conducted an analysis of NED on the dimension of informal integration. This was accomplished through semi-structured interviews with key informants within NED. This facilitated identification of the liaison devices and integration mechanism(s) utilized within each period to coordinate activities both within and between major elements. The organization of each period was then classified using the organizational theory presented in chapter 2.

7. OVERALL EVALUATION OF NED.

The objective of this chapter is to pull together the organization classifications of chapters 4 through 6 and present a cohesive picture of adaptive change within NED. This will be accomplished through a comparison of the hypothesized results based on Contingency Theory (chapter 3) to the findings of chapters 4 through 6 which were obtained using dimensional measures. This analysis is performed for each period resulting in an overall classification of the organization structure and identification of the associated coordination mechanism. In addition, critical variables in this process are identified. (See figure 16)

7.1. Period 1, (1955-1961).

The classification of period 1 accomplished in chapters 3 through 6 is depicted in figure 45. Excluding the analysis of chapter 6, there is relative consistency of results. The organization is a Carbon Copy Bureaucracy. This results from an environment which was relatively stable and nonhostile in its demands upon NED. These demands focused on responsive action engineering. This enabled the development of strong mediating factors within NED personified by the Division Engineer and the Chief of

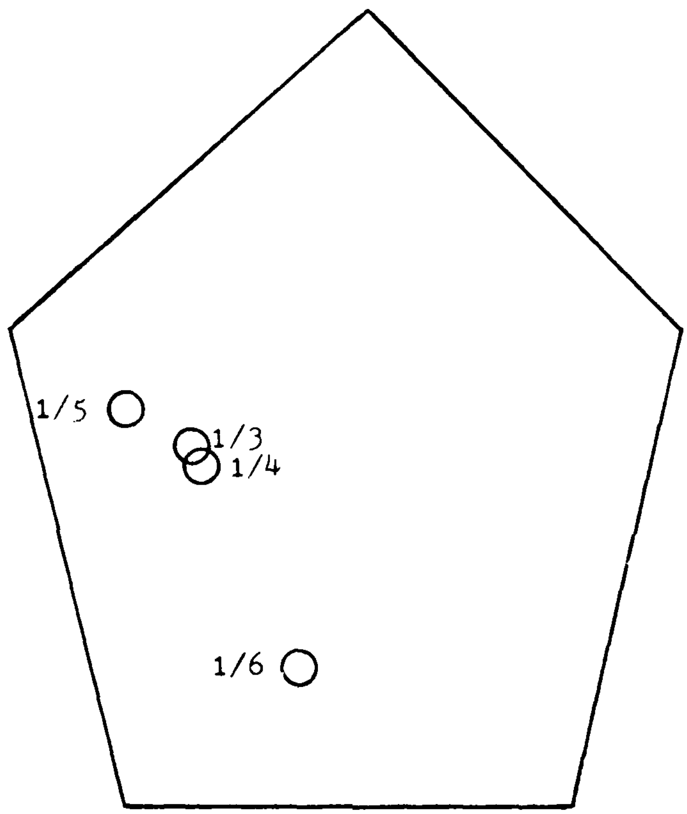

FIGURE 45: COMPARISON OF PERIOD 1 CLASSIFICATIONS OF NED.

the Engineering Division. As a result, they were able to control the influence of demands arising in the environment and translate them into action.

7.1.1. Program Spectrum.

The program spectrum consisted of major projects in the flood control protection category such as earthen dams. This enabled NED to draw upon its site adaptation experience developed through military construction programs. In addition, as the organization grew within this period, structuring along geographical boundaries especially within Area Offices occured.

7.1.2. Coordination.

Integration of activities was accomplished through a formalized hierarchy relying upon standard flows and standardization of outputs such as site adaptation of previously successful projects. These characteristics draw the organization between the Divisionalized Form and the Machine Bureaucracy.

The existence of Project Engineer teams in chapter 6 shows some evidence of matrix structure. The geographic basing of these teams exerts movement to the Divisionalized Form. The reliance upon professional

skills of team members and decentralized method of program implementation exerts strong movement to the lower right of the Pentagon. These methods of integration are not congruent with what one would expect given the classification of the environment in chapters 4 and 5. This resulted from the relative stability and certainty of the environment which enabled the Chief of Engineering to amass considerable power and influence. He was able to handle demands, exercise his leadership perogative and insert his methods of standardized program implementation by establishing Project Engineer teams described in section 6.2. In this manner, he was able to satisfy his power needs and utilize an internal method of program implementation which was inconsistent with the configuration-integration fit one would expect. Rather than rely upon a bureaucratized machine, he selected and implemented professional multi-disciplined teams to effect integration.

7.1.3. Conclusions.

The organization of period 1 was a Carbon Copy Bureaucracy presenting an outward appearance of a semi-divisionalized machine. Yet, internally the tasks were completed by a small nucleus of professionals who operated in a highly autonomous fashion. This seemingly inconsistent approach to program implementation resulted

from the strength of the mediating elements. The organization of peri<0x0A>od 1 operated along the line depicted in figure 46.

7.2. Period 2, (1962-1968).

The classification accomplished in chapters 3 through 6 is depicted in figure 47. The analyses of chapters 3, 4 and 5 resulted in a tightly grouped classification while that of chapter 6 lags somewhat behind.

7.2.1. Environment.

The environment increased in hostility stemming from increased public concerns for program accountability. This resulted from external demands and internal shifts. The external demands arose from environmental awareness under the 1965 Water Quality Act. This downplayed the importance of responsive action engineering oriented solutions. The internal factors resulted from declining civil works and military programs decribed in section 3.4 which caused personnel reductions and functional area consolidations.

7.2.2. Mediating Elements and Coordination.

The Chief of the Engineering Division consolidated his

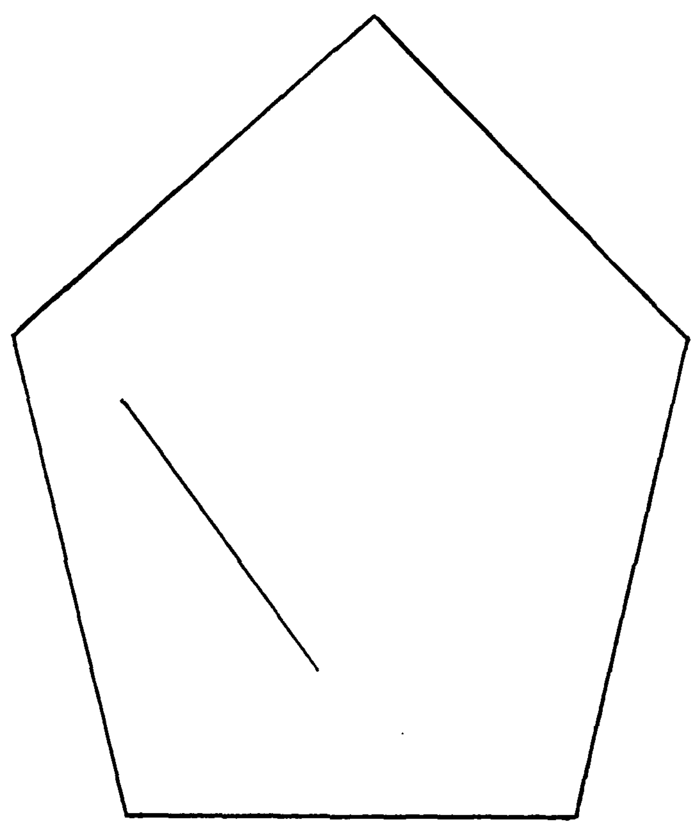

FIGURE 46: OVERALL PERIOD 1 CLASSIFICATION OF NED.

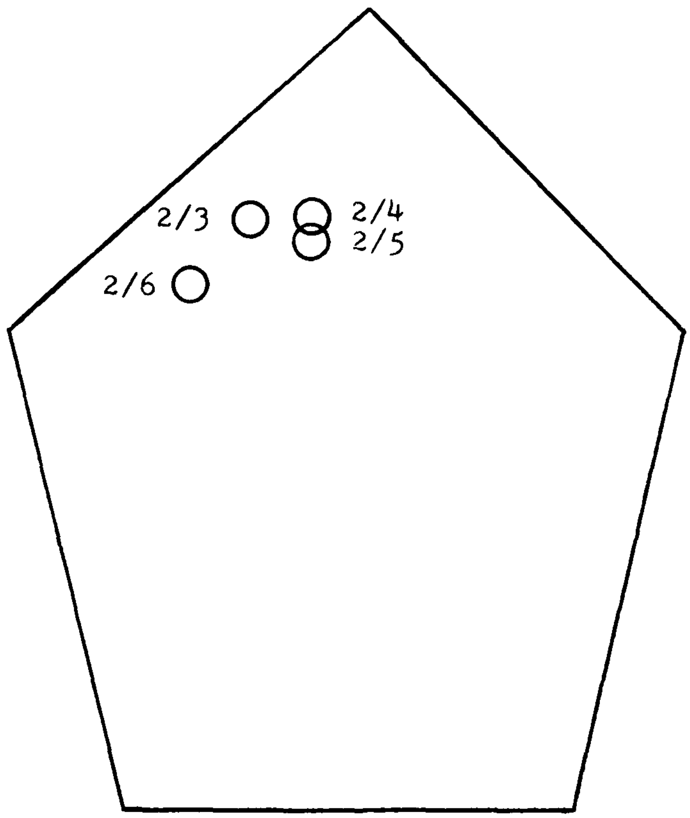

FIGURE 47: COMPARISON OF PERIOD 2 CLASSIFICATIONS OF NED.

powers, thereby increasing his effectiveness as a mediating mechanism. He continued relying upon the professional Project Engineer teams during the first part of period 2.

In the latter portion of period 2, the Chief of Engineering relied upon Project Managers. The permanently established multi-disciplined teams of period 1 gave way to an increased system of hierarchical flows. The narrow functional groupings at the lower levels were consolidated into more broadly functional elements in period 2. Emphasis shifted from design/implementation to planning/design. This increased management activities of the Project Managers at the expense of engineer duties. This also increased reliance upon direct supervision by the managerial hierarchy.

7.2.3. Conclusions.

The stability of the environment enabled reliance upon a configuration which was conducive to systematized production through standardized flows. Integration still relied upon professional skills. However, the shift from engineer integration teams drawing support from technical elements to integration through managers totally dependent upon support from technical elements indicates movement to the upper left of Mintzberg's Pentagon. This placed the managerial hierarchy in a more central role to exercise

direct supervision as well as coordinate with program facilitators. The organization of period 2 was a Simplest Bureaucracy reliant upon standardized flows monitored and run by the managerial hierarchy. The organization configuration-integration fit is closer than in period 1. This occured with an intensification of demands in the external environment. The organization of period 2 is constrained to operate within the oval shown in figure 48.

7.3. Period 3, (1969-1973).

The classification accomplished in chapters 3 through 6 is depicted in *figure* 49. These analyses produced a relatively tight grouping. However, the analysis of chapter 5 is separated from the centroid of the other classifications.

7.3.1. Environment.

The environment of this period intensified in both complexity and uncertainty resulting from regulatory constraints under NEPA. This was accompanied by the loss of the military construction program coupled with an increased importance of operations and maintenance as an NED priority. The investment program of NED entered a period of rapid decline accompanied by a shift towards

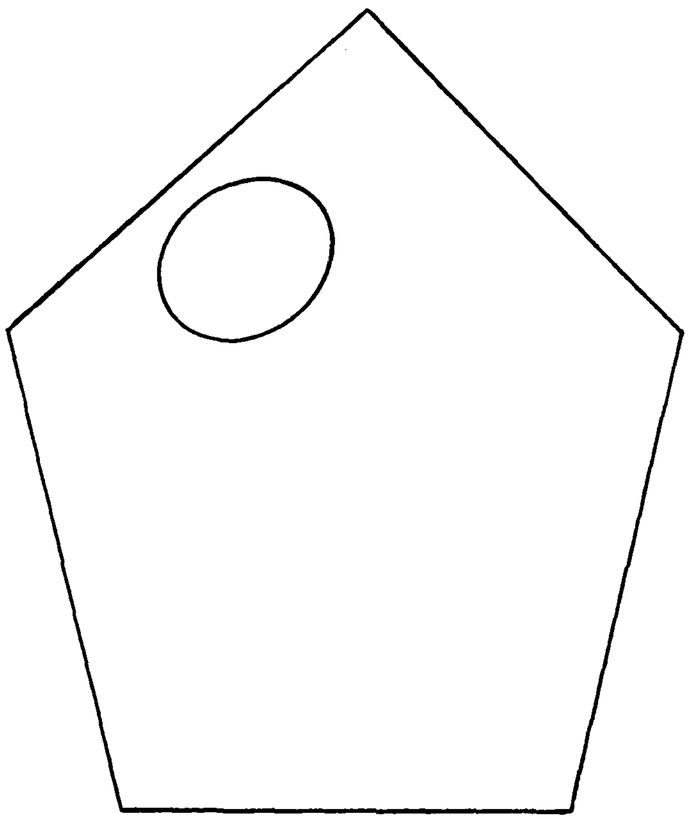

FIGURE 48: OVERALL PERIOD 2 CLASSIFICATION OF NED.

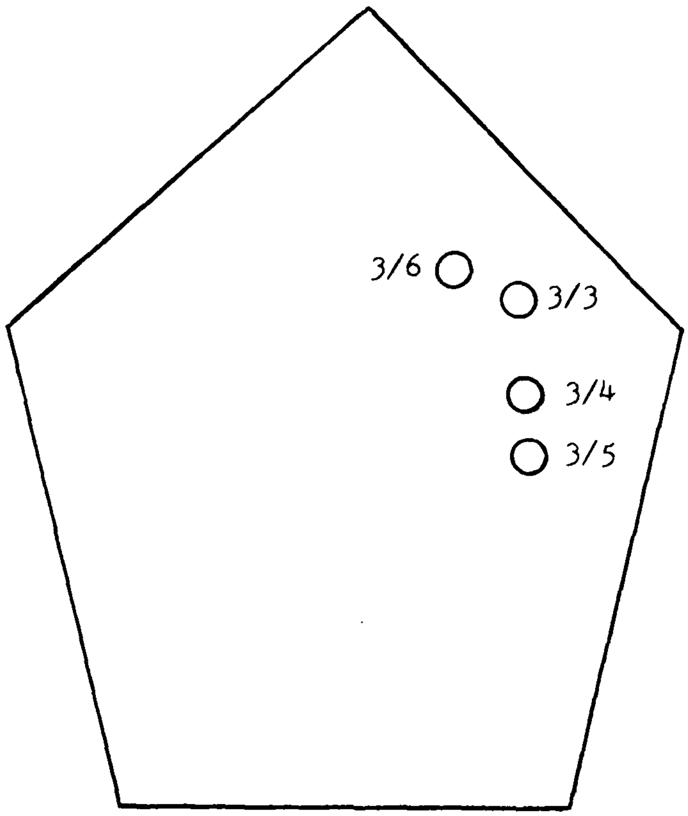

FIGURE 49: COMPARISON OF PERIOD 3 CLASSIFICATIONS OF NED.

increased reliance upon small projects as NEPA protracted the implementation of major programs.

7.3.2. Mediating Elements.

The mediating elements were no longer able to effectively handle external demands. The Chief of the Engineering Division's interaction with the public sector encompassed a wider spectrum of demands which taxed his ability to effectively receive, evaluate and translate them into program actions. As a result, he was forced to rely more upon his Project Managers and managerial hierarchy to interface with the public and agency elements in period 3. This increased reliance upon the professional skills which occurred during a period of reduced experience resulting from factors such as the retirements of '72 & '73, and personnel reductions stemming from a declining investment program.

7.3.3. Coordination

The mechanistic flows and direct supervision of period 2 was ineffective as demand complexity increased in period 3. This necessitated decentralization of activity coordination. Reliance upon Project Managers resulted in coordination through standardization of skills.

7.3.4. Conclusions.

As the mediating capabilities of the Chief of Engineering were dissipated downward to his Project Managers, the system of flows supplemented by manager supervision gave way to professionalization of the operating core. Integration of activities became more complex and fluid, necessitating intensive management at the lower middle line. The Project Management Branch fulfilled this need through informal temporary crossfunctional teams. These factors are characteristic of the Professional Bureaucracy, but they do exert a slight pull to the left towards the Machine Bureaucracy resulting from dependence upon the managerial hierarchy. The organization of period 3 maintains a fairly close configuration-integration fit and is classified as a Simplest Professional Bureau Adhocracy. This organization was constrained to operate in the oval depicted in figure 50.

7.4. Period 4, (1974-1979).

The classification accomplished in chapters 3 through 6 is depicted in figure 51. The analyses of these chapters produced the most tightly grouped classifications along all dimensions thus far.

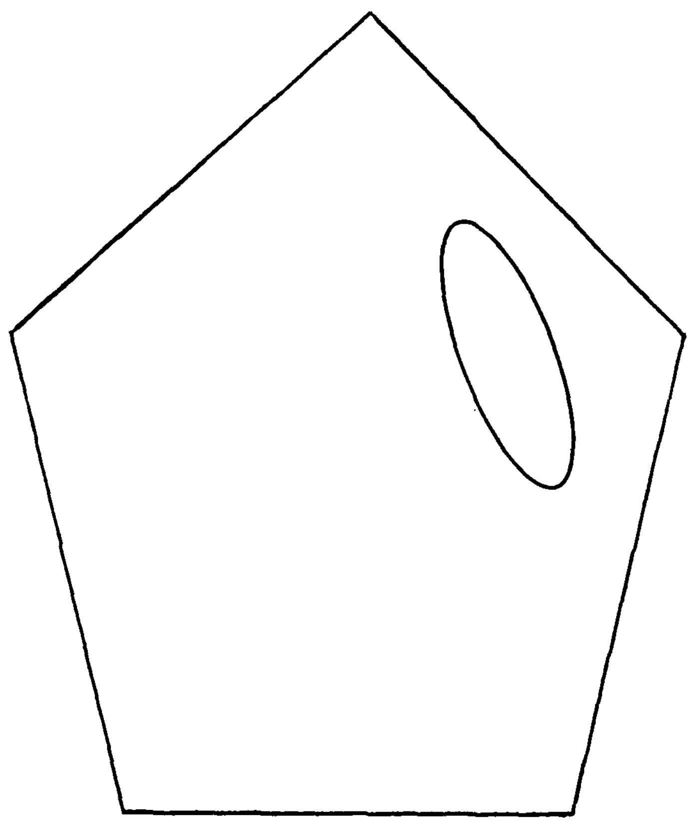

FIGURE 50: OVERALL PERIOD 3 CLASSIFICATION OF NED.

AD-A141 776 LONGITUDINAL STUDY OF THE PROGRAMS AND THE ORGANIZATION OF A DIVISION OF THE CORPS OF ENGINEERS(U) ARMY MILITARY PERSONNEL CENTER ALEXANDRIA VA T A HOLDEN MAY 84 4/5

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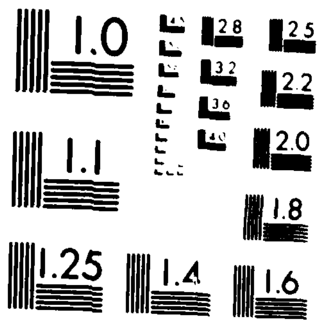


MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

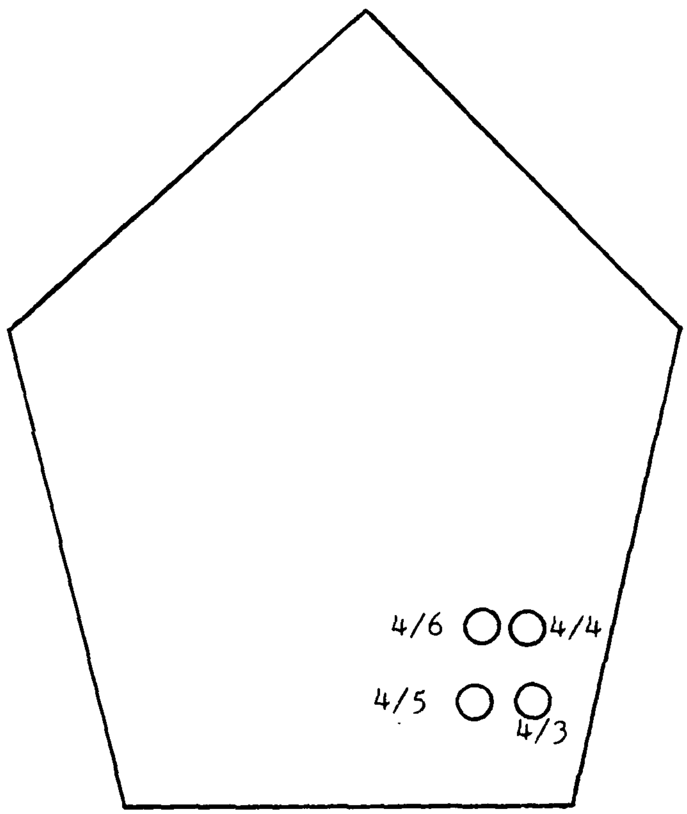


FIGURE 51: COMPARISON OF PERIOD 4 CLASSIFICATIONS OF NED.

7.4.1. Environment

The environment intensified to its highest levels in this period due to three factors: intensification of regulatory constraints under NEPA, funding constraints arising from the annual Congressional Omnibus starting in 1976, and a continued decline in the overall NED civil works program. These factors resulted in fluctuating program priorities between remaining major programs under implementation and small programs, as well as between categories of programs (navigation, flood control protection and beach erosion protection). This was accompanied by increased importance of operations and maintenance to NED which detracted from civil works program implementation.

These factors translated into further consolidation of functional activities within the Engineering Division as well as across the board personnel reductions in the Planning and Construction Divisions. The increased importance of the Planning Division coupled with the loss of highly directive leadership resulting from the retirement of the Chief of Engineering led to a redistribution of power within NED. In his place, the Chiefs of Planning, Engineering and Construction as well as the Division Engineer performed as mediating elements. As a result, dependence upon decentralized activity

integration increased.

7.4.2. Coordination.

The Project Manager was given increased authority by the managerial hierarchy to interact with the environment. The findings of chapters 5 and 6 substantiate that he coordinated through direct contacts with external elements such as agencies and the public in order to transcribe demands into NED actions. This increased his need to interact informally within NED to coordinate program implementation activities. This resulted in increased reliance upon crossfunctional team management.

7.4.3. Conclusions.

The organization of period 4 was drawn to a more decentralized method of operation. The loss of mediating elements coupled with a shift towards environmental uncertainty and program complexity resulted in a rather scrambled ensemble to fulfill the voids. One would expect this to draw the organization to the top of Mintzberg's Pentagon. However, the mediating elements were relatively ineffective, hence all external demands resulted in translation to a complex, high turn over, management intensive 'nightmare' of small projects. This internally perceived environment is consistent with coordination

through mutual adjustment based upon direct managerial contacts with program implementators (Project Managers). Hence, the organization's lack of strong leadership in the mediating elements forced it to adhere to a very tight configuration-integration fit as evidenced by the oval area of operations for period 4 depicted in figure 52. The organization is classified as an Entrepreneurial Adhocracy.

7.5. Period 5, (1980-1983).

The classification accomplished in chapters 3 through 6 is depicted in figure 53. The analyses of these chapters produced a more loosely grouped classification along the four dimensions than in period 4. The classfication along the dimensions of integration in chapters 5 and 6 is separated more distinctly from those of chapters 3 and 4.

7.5.1. Environment and Mediating Elements.

The environment of period 5 remained relatively complex, yet it decreased in uncertainty. This resulted from two factors: NED adaptation to the increased level of external demands and increased effectiveness of the mediating elements. The former resulted from continued exposure to regulatory and funding constraints impacting upon program implementation. This was coupled with a

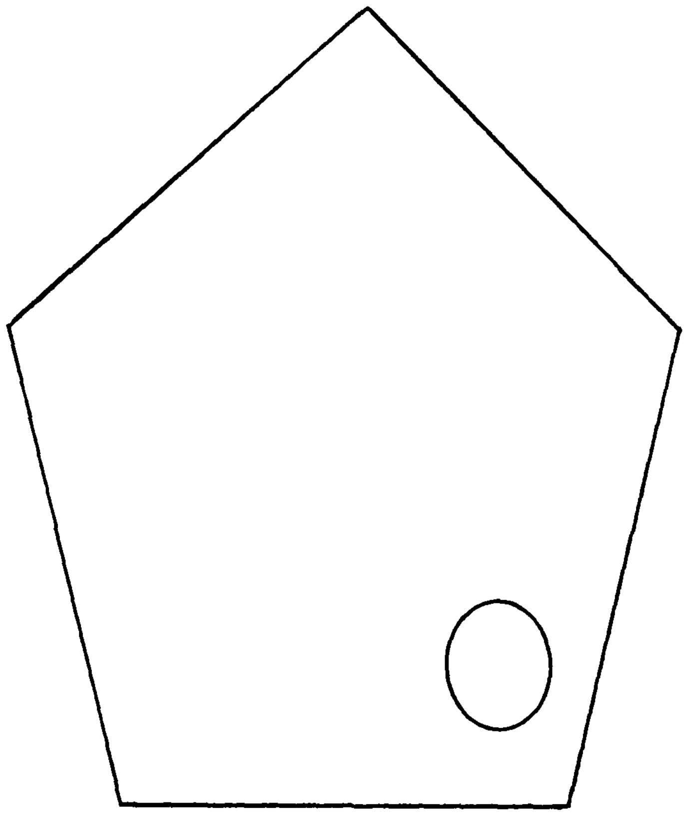


FIGURE 52: OVERALL PERIOD 4 CLASSIFICATION OF NED.

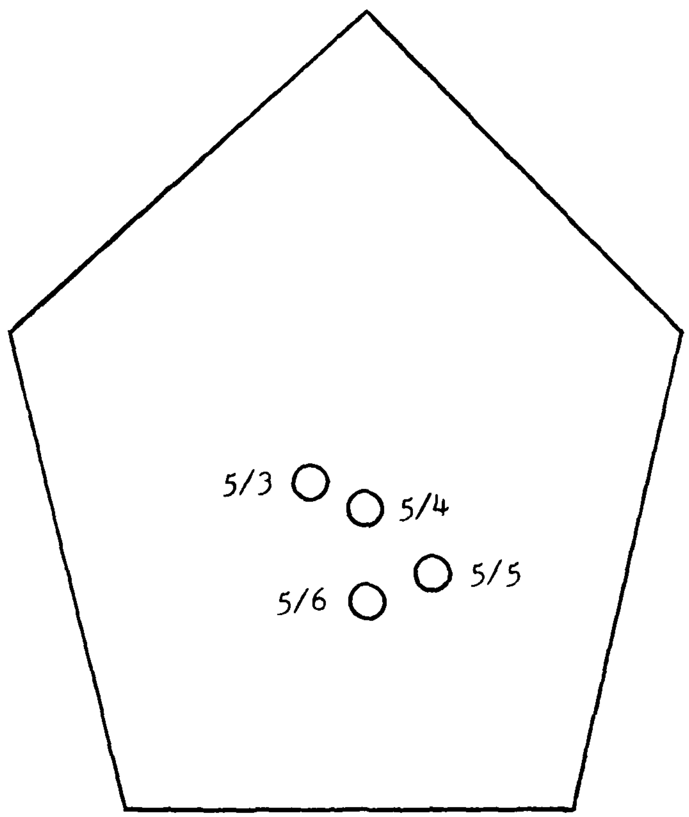


FIGURE 53: COMPARISON OF PERIOD 5 CLASSIFICATIONS OF NED.

redistribution of boundary spanning roles in period 5. Through exposure and experience, the mediating elements, especially the Project Managers, became adepth in anticipating demands thereby planning more comprehensively. This reduced external interference in program implementation since the organization had taken on a more translucent appearance.

7.5.2. Coordination.

The formalization of Project Management provided the Project Manager authority to coordinate more freely in the implementation of programs. It resulted in an upward communication flow. This necessitated increased reliance by Project Managers on paper systems to inform the managerial hierarchy of progress. This process increased reliance upon managerial tools such as PRB's and Feeder reports by the managerial hierarchy. Thus the formalization of Project Mangement on the one hand increased decentralized operations of the Project Manager, on the other hand it had an intractable inflexibility necessitating more interaction/management by the managerial hierarchy including the strategic apex. Thus it elevated problems quickly. As a result, it established a system of flows within a decentralized matrix structure.

7.5.3. Conclusions.

The organization of period 5 had strong mediating elements interacting with the external environment. These individuals, especially the Project Managers, were able to translate demands into actions thereby reducing the perceived uncertainty (hostility). This enabled a looser configuration-integration fit than observed in period 4. This was attributable to efforts by the organization to reconfigure with integration through a system of flows seen in period 2. Yet, the implementation of programs was achieved primarily through mutual adjustment and matrix teams. However, the standardization of processes was inserted through the formalities of the new Project Management process such as PRB's. The organization formalized those activities essential to program implementation while leaving some informal decentralization of peripheral activities. It is classified as an Entrepreneurial Adhocracy constrained to operate in the oval of figure 54.

7.6. Configuration-Integration Flow.

The results of figures 46, 48, 50, 52, and 54 have been plotted in figure 55. In addition, the environmental shifts have been plotted in figure 56.

From these two figures, one can see that as the

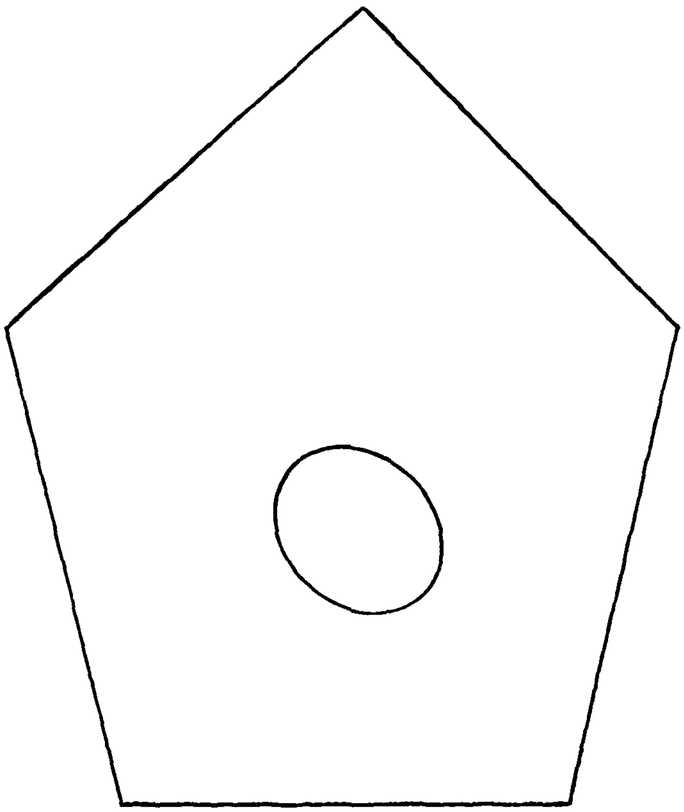


FIGURE 54: OVERALL PERIOD 5 CLASSIFICATION OF NED.

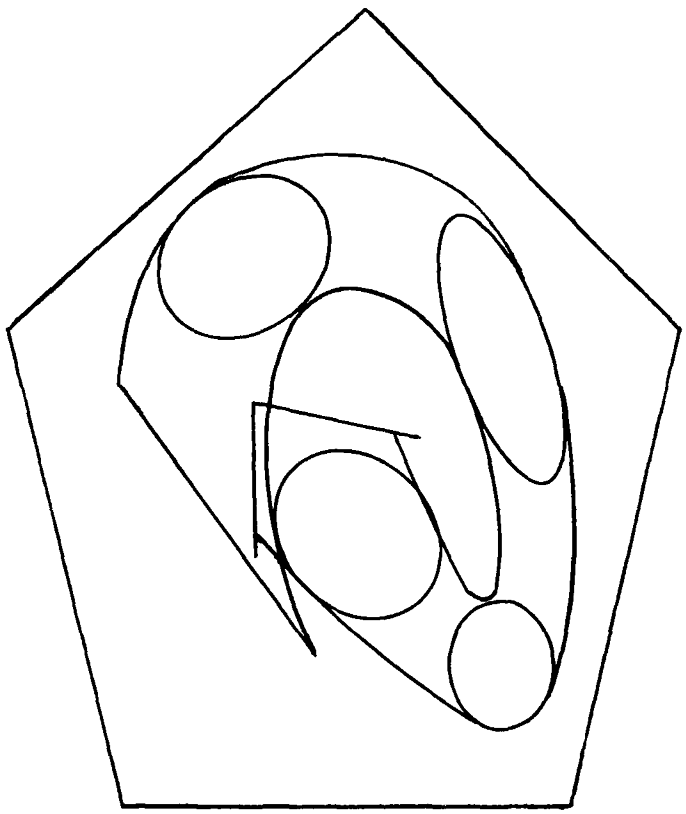


FIGURE 55: NED CYCLICAL PROCESS OF ADAPTATION.

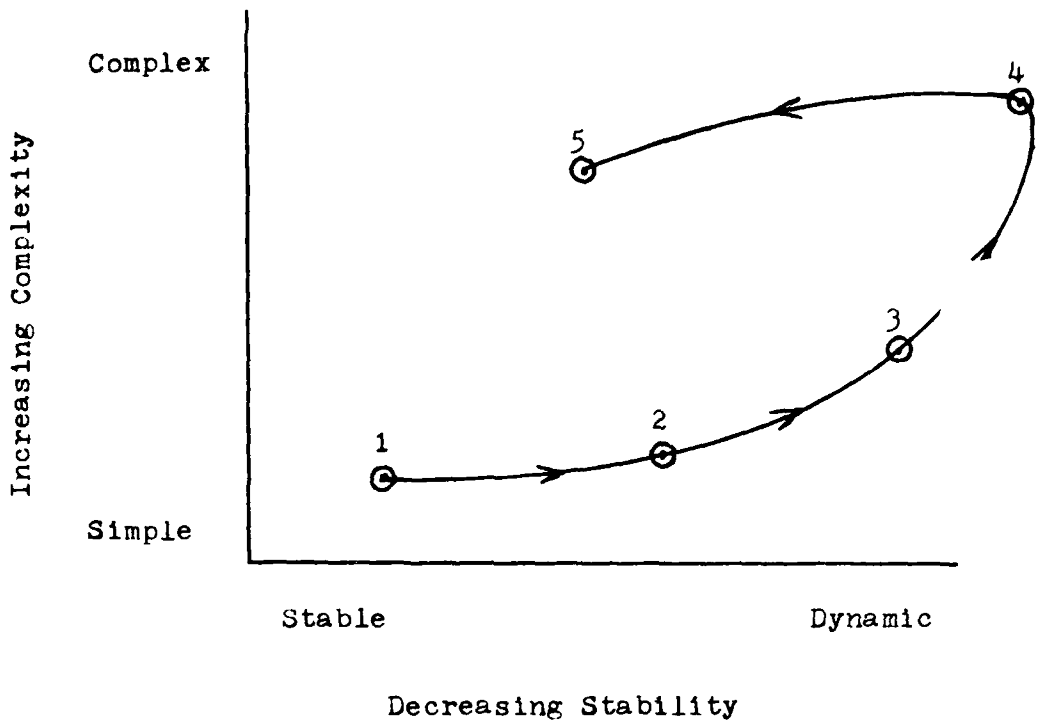


FIGURE 56: CLASSIFICATION OF NED 'S ENVIRONMENT BY PERIOD.

environment shifted from the lower left in figure 56 to the upper right, the organization moved clockwise from the middle left of Mintzberg's Pentagon to the lower right. (See figure 55) In addition, in comparing the period 5 environment to that of period 1, one can see they are both relatively stable allowing the organization to move toward the Machine Bureaucracy.

One can conceptualize the mediating elements as a wall through which external demands must penetrate in order to impact upon NED. The mediating elements were characterized as strong in periods 1 and 2, and decreasing in effectiveness in periods 3 and 4. As external demands shot holes in the wall through increased volume or multiplicity of spectrums, they decreased the effectiveness of the mediating elements. As a result, the mediating elements were no longer able to "protect" the internal structural configuration and integration mechanisms from the impact of external demand(s).

When the mediating elements are strong, the organizational configuration and integration mechanism do not necessarily have to "fit" according to Contingency Theory. This enables the organization to operate in a manner inconsistent with the structural configuration. It operates in a manner selected by the controlling mediating elements such as observed with Chief of

Engineering in period 1. As the mediating elements lose their control over the environment, the organization becomes more translucent. Thus, the width of the arrow narrows in figure 55 until the demands impact so strongly that the organization configuration-integration fit is almost exactly as prescibed in Mintzberg's model such as in period 4. As the environment becomes relatively stable such as in period 5, the organization configuration-integration fit becomes more loose.

Thus as one moves from the lower left in figure 56 to the upper right, not only does this produce a movement towards the lower left of Mintzberg's Pentagon, it also produces a more constrained choice of organization configuration-integration selections. This results directly from the decreasing effectiveness of the mediating elements. Hence, the capacity of the mediating elements also decreases as the environment moves to the upper left in figure 56.

Figure 55 indicates a tendency towards a cyclical process by NED in both or configuration and integration changes. As the organization gains control over its environment such as in periods 1 and 5, it tends to establish flows and hierarchical integration from an outward perspective while utilizing a decentralized matrix structure internally to implement programs. The former is

appears to be a sort of facade for public consumption while the latter is the method of operation. Thus one can characterize the upper left position of Mintzberg's Pentagon as the stable or equilibrium position of NED. If NED could control for the internal impact of external demands, it would tend to seek the configuration-integration position in the vicinity of the period 1 and 2 classification. Only as the environment breaks down the mediating elements' wall characteristics does NED become more intractable resulting in an increasingly constrained clockwise movement along the cyclical arrow in figure 55.

8. CONCLUSIONS AND IMPLICATIONS.

The objective of this chapter is to synthesize the findings of this thesis and present some considerations for further study which surfaced during the conduct of this study.

8.1. Conclusions.

As a result of the analyses undertaken in this thesis, the following conclusions regarding NED in particular and public works organizations in general can be made:

8.1.1. Environment Complexity and Organization Openness.

External demands determined the composition and breadth of NED activities. Although the mediating elements translated these demands into action, the demands arising in the environment caused shifts in internal program priorities. This often resulted in reorganization within major and subelement functional activities which elevated or demoted activity importance in program implementation.

The environment itself was complex composed of multiple causalities. The three elements evaluated (agencies, politicians and public) had interdependencies which

revealed a causation process of demands impinging upon NED. This process served to intensify (or weaken) demands based on the concensus (or lack of concensus) arising from their sources. This process of program restructuring eroded/changed organization structure as well as worker skills.

Thus, the study of NED corroborated the findings of both Meyer (33) and Lawrence and Lorsch (28) that organizations are extremely susceptibile to influence to demands arising outside the organization. These factors arise from multiple sources and they may be interrelated or independent. Hence, they exert multiple pulls upon different parts of the organization.

8.1.2. Influence of Mediating Elements.

The strength of the mediating elements in public organizations such as NED is critical. They serve as buffering mechanisms which control the environmental effects upon the organization. The success of these elements in translating demands into organizational activities influences the adaptation of organization integration and structural configuration within the Pentagon. Their success is directly related to their ability for absorbing hostility and complexity onto themselves and transmitting a simplified, less hostile set

of demands within the organization for action. Their ability to effect these duties is directly related to individual span of control manifested by volume, intensity and diversity of demands.

8.1.3. Role of Military Construction.

NED utilized the Military Construction program as a training tool to prepare its personnel to undertake the more complex and demanding civil works program. It was a mechanism which enabled sustainment of program implementation capacity. The loss of this program in early 1971 revealed the role it had played previously in periods of decreased civil works activity as well as its vitalness to the organization's professional health.

8.1.4. Flexibility.

NED demonstrated three additional capacity sustaining mechanisms during the period of study. When faced with a difficult engineering task or an overwhelming volume of programs, NED has the option to contract the design phase of programs out to Architect-Engineers. This 'ace in the hole' was used in period 4 on the Charles River Dam Project.

The second mechanism is to expand internal activities

creating new functional areas as required to undertake specific activities or programs. This was observed in the creation of elements to implement the hurricane studies program of the 1950's, NASA program of the 1960's, and the Postal Program and EPA Support Program of the 1970's. One suspects that this ability to expand based upon program increases could be utilized in the event of another civil works program boom similar to that of the 1950's.

The final mechanism is NED's ability to draw upon resources from within the Corps of Engineers family for assistance on matters beyond NED expertise. This was employed in areas such as model testing at the Waterways Experimental Laboratory in Vicksburg Missippi.

Thus, as a member of the Corps family, NED possesses several trump cards enabling it to undertake rapid program changes in the areas of public works.

8.1.5. Reliance on A-E's.

Public work dependence upon Architect-Engineer firms to implement program activities should not be the normal mode of operation. In the short run this might produce a better product when internal resources cannot handle the workload or the technical complexities of a project, however, long term reliance upon this mode of

implementation drains the organization of the planning, design and coordination challenges which develop the public works organization into a proficient engineering agency. This not only weakens its ability to plan and design, but it ultimately reduces its ability to supervise the A-E contracts.

8.1.6. Influence of Size.

Contrary to findings of Meyer (33) and Lawrence and Lorsch (28), size is not an independent contingency factor. The findings of this thesis strongly indicate that it is highly susceptible to the influence of external demands through the alteration of investment programs. This suggests that it is a dependent variable which determines structural configuration.

8.1.7. New Contingency Theory.

The conception of symbiotic configurations with a structural configuration associated with an integration mechanism as exposed by Mintzberg is incorrect. The findings of chapter 7 as well as those of Lawrence and Lorsch (28) indicate that there is a decay-fit relationship between these two factors which is time-dependent. The thesis findings indicate that the degree of "appropriateness" between the theoretical

integration-structural configuration fit is dependent upon the environment. The more stable and uncomplicated the external demands upon the organization, the more latitude the organization has to select seemingly inapropriate integration-configuration selections.

8.2. Implications.

This study revealed several implications and considerations for further study:

8.2.1. Cycle of Change.

The study of NED revealed a cyclical process of adaptation. NED demonstrated a tendency to seek an organizational configuration mirroring a Machine Bureaucracy based on the relative strength of the mediating elements. Investigation of the presence of this cyclical process in other public organizations is needed. Verification of this tendency in other studies of public works organizations could provide a new contingency model applicable to these organizations which could be used as a diagnostic tool to maximize configuration-integration selection. This might assist public works organizations in reducing the impact of fluctuating programs on organization program implementation capabilities.

8.2.2. Private versus Public Employment.

Further study of the effects upon public works organizations resulting from exodus of entry-level to mid-level technical personnel to more lucrative opportunities in the private sector is needed. This should be accomplished in the context of declining investment programs, limited advancement potential, depressed salaries in the public sector and the frustrations of program implementation in the slow cumbersome "bureaucracy". Focus upon the impact of increased volume of unimplemented project designs on design engineers is a relevant and critical dimension of this problem in light of increasing budgetary constraints upon these organizations. This could be coupled with a study of the the shift from engineering designers to managing/engineering designers.

8.2.3. Trainee Programs.

Analysis of organization trainee programs for newly acquired engineers is needed. This should focus on the impact of an overview presentation versus the traditional work in each major sublevel for better exposure. The former is currently used today and provides the trainee with a few days of orientation to all activities in each level of the organization. Thus it provides the knowledge

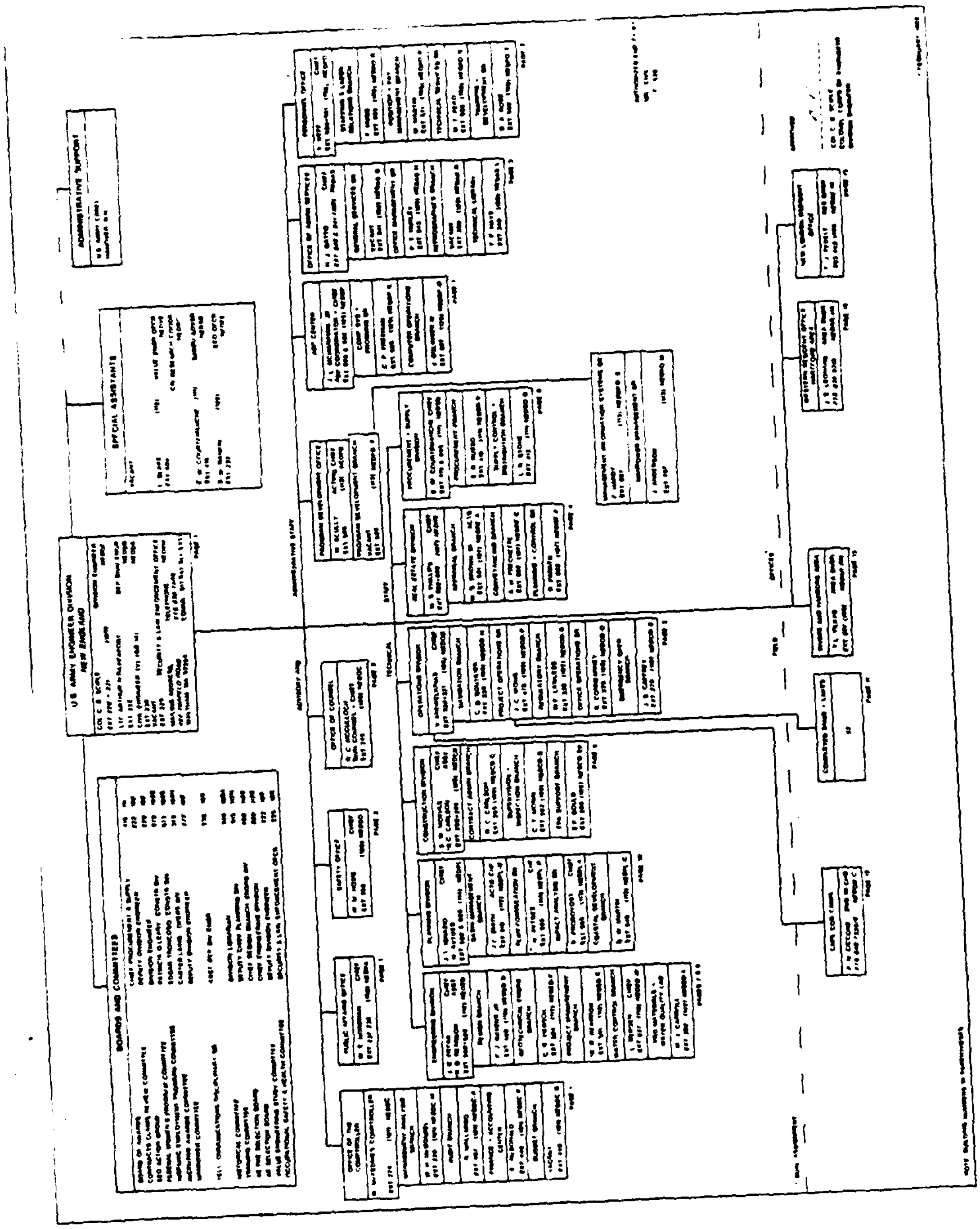
of where to go and possibly to whom. In addition, it hopefully provides insight into the workings of the organization. This type of indoctrination is conducive to the management intensive concept. The latter approach is a learn by doing. The trainee is assigned on a monthly or longer basis to subelements to learn how to do their jobs. It not only provides exposure but also develops general expertise. This method of indoctrination is prominent in the action agency.

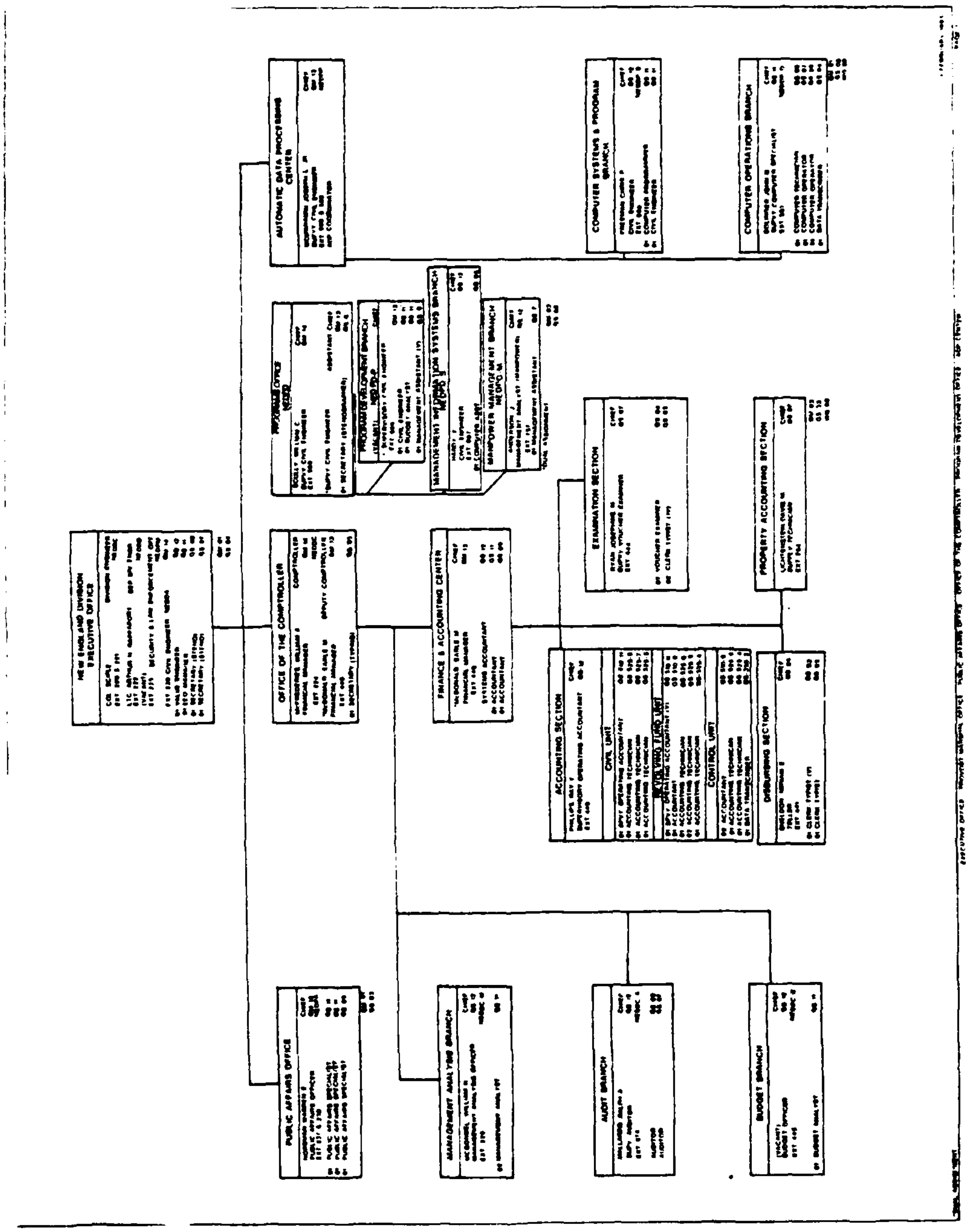
A study along these dimensions might provide some interesting conclusions regarding organizational adaptation to shifts in investment program implementation, especially with the infrastructure rejuvenation programs now facing many public works departments. In addition, it might provide another dimension of insight into organizational capacity sustainment not previously addressed.

APPENDIX A

Organization Chart

1 February 1983

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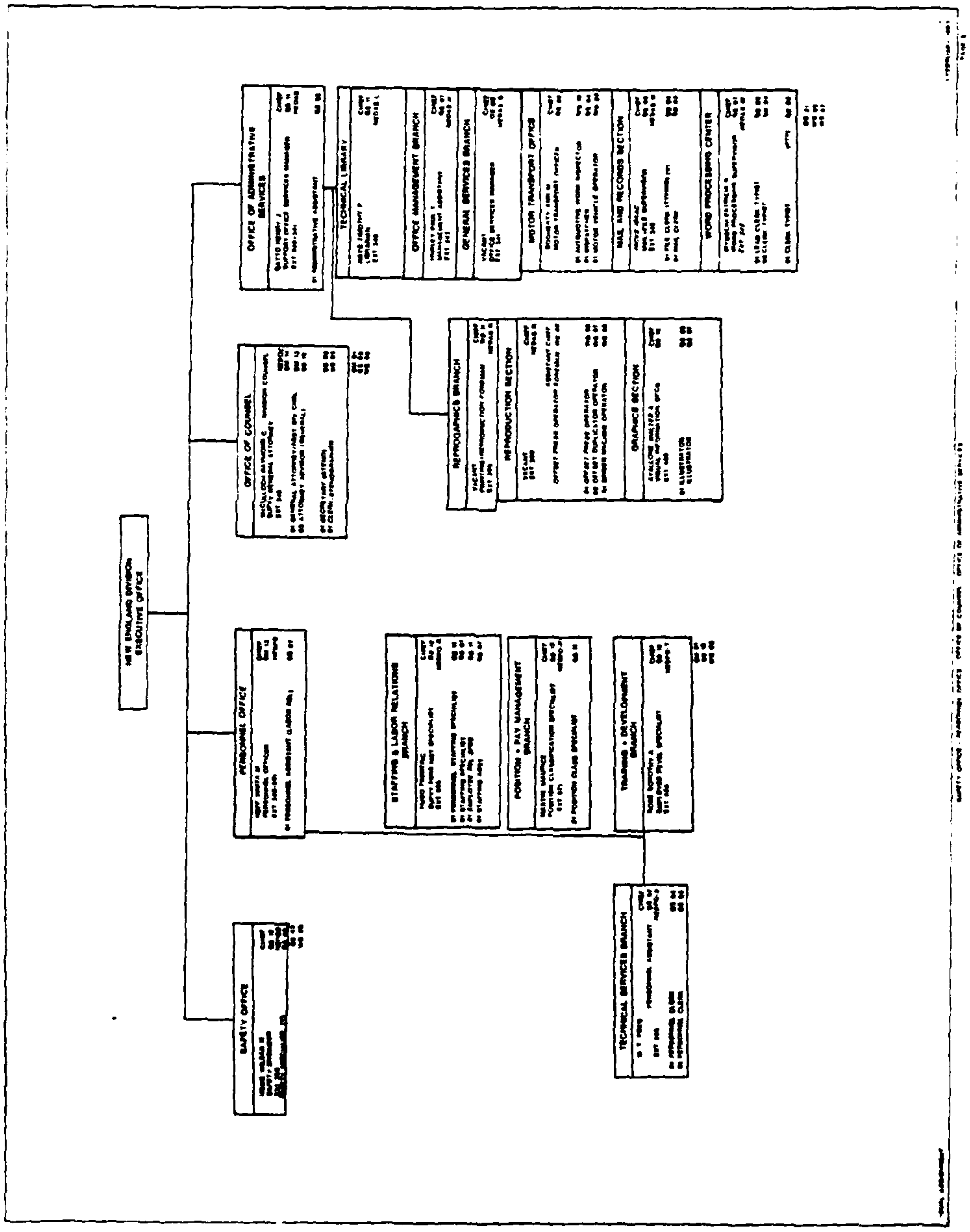
OFFICE OF THE COMPTROLLER
FINANCE & ACCOUNTING CENTER
ACCOUNTING SECTION
CIVIL UNIT
CONTROL UNIT
DISBURSING SECTION
EXAMINATION SECTION
PROPERTY ACCOUNTING SECTION
AUTOMATIC DATA PROCESSING CENTER
COMPUTER SYSTEMS & PROGRAM BRANCH
COMPUTER OPERATIONS BRANCH
PUBLIC AFFAIRS OFFICE
MANAGEMENT ANALYSIS BRANCH
AUDIT BRANCH
BUDGET BRANCH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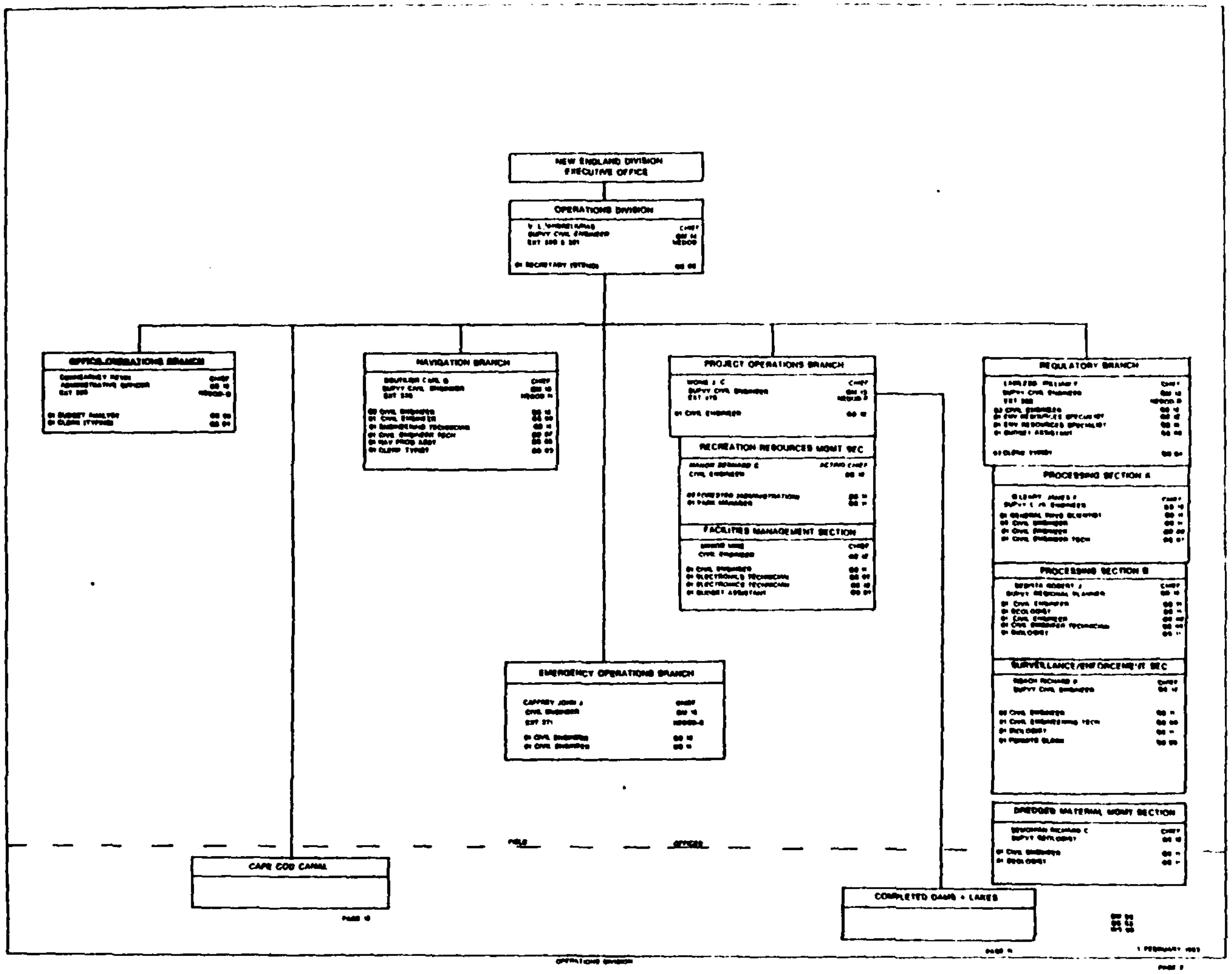
SAFETY OFFICE
PERSONNEL OFFICE
OFFICE OF COUNSEL
OFFICE OF ADMINISTRATIVE SERVICES
TECHNICAL LIBRARY
OFFICE MANAGEMENT BRANCH
GENERAL SERVICES BRANCH
MOTOR TRANSPORT OFFICE
MAIL AND RECORDS SECTION
WORD PROCESSING CENTER
REPROGRAPHICS BRANCH
REPRODUCTION SECTION
GRAPHICS SECTION
STAFFING & LABOR RELATIONS BRANCH
POSITION + PAY MANAGEMENT BRANCH
TRAINING + DEVELOPMENT BRANCH
TECHNICAL SERVICES BRANCH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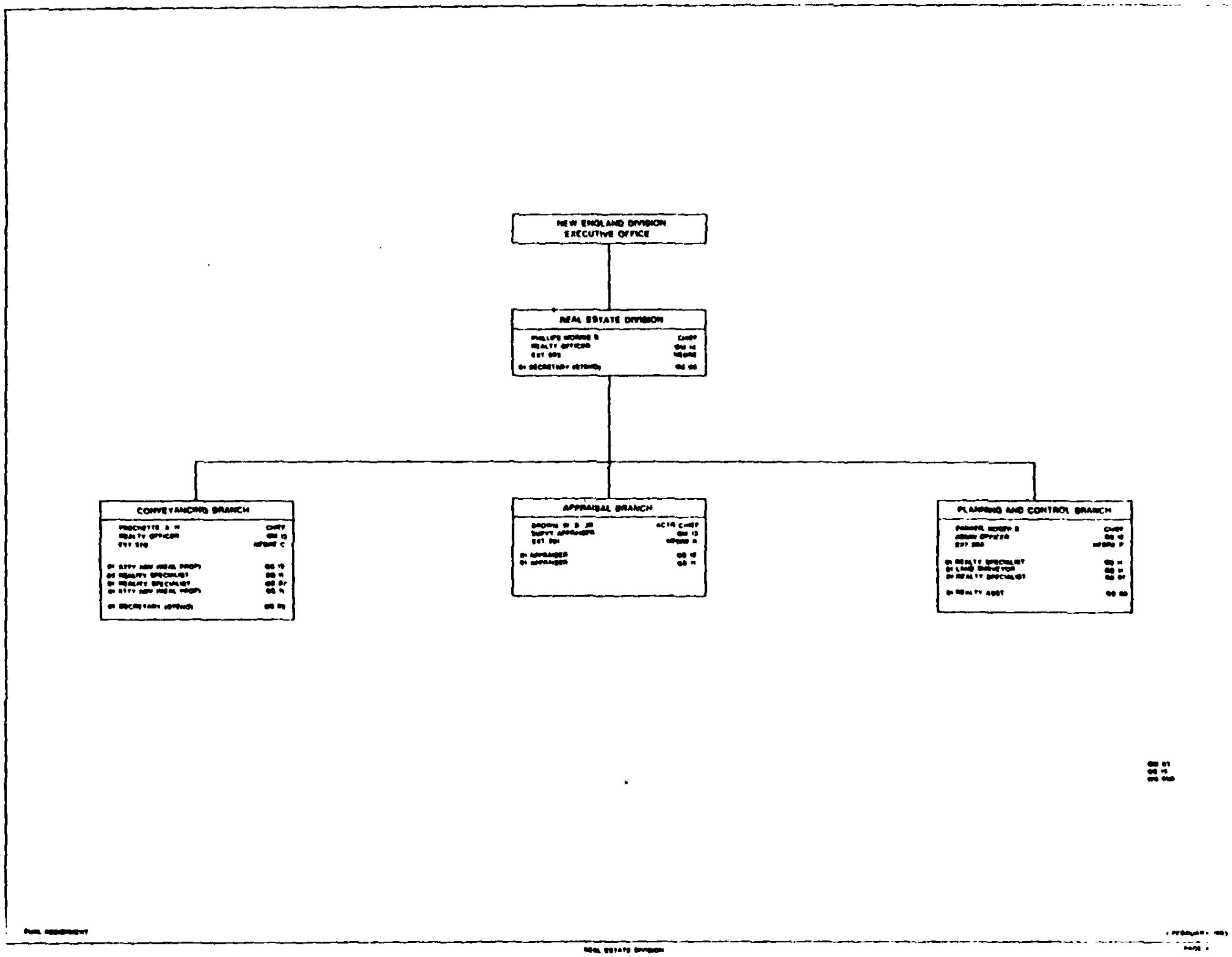
EXECUTIVE OFFICE
OPERATIONS DIVISION
NAVIGATION BRANCH
PROJECT OPERATIONS BRANCH
RECREATION RESOURCES MGMT SEC
FACILITIES MANAGEMENT SECTION
REGULATORY BRANCH
PROCESSING SECTION A
PROCESSING SECTION B
SURVEILLANCE/ENFORCEMENT SEC
DREDGED MATERIAL MGMT SECTION
EMERGENCY OPERATIONS BRANCH
FIELD
OFFICES
CAPE COD CANAL
COMPLETED DAMS + LAKES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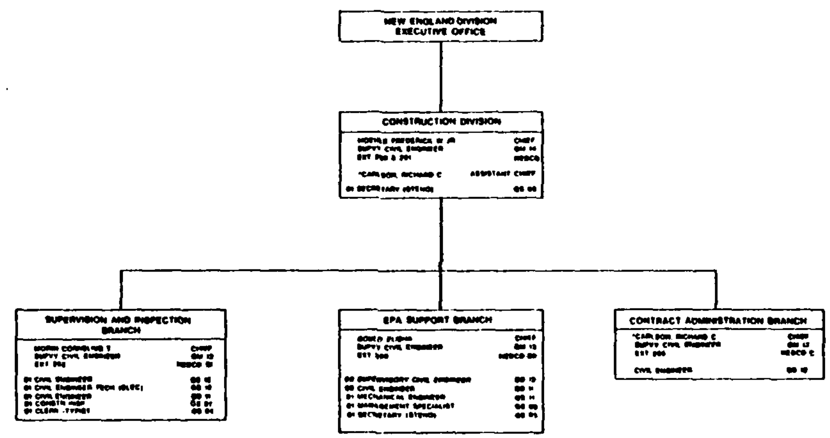
EXECUTIVE OFFICE
REAL ESTATE DIVISION
REALTY OFFICER
CHIEF
CONVEYANCING BRANCH
REALTY OFFICER
CHIEF
APPRAISAL BRANCH
ACTG CHIEF
PLANNING AND CONTROL BRANCH
CHIEF
REAL ESTATE DIVISION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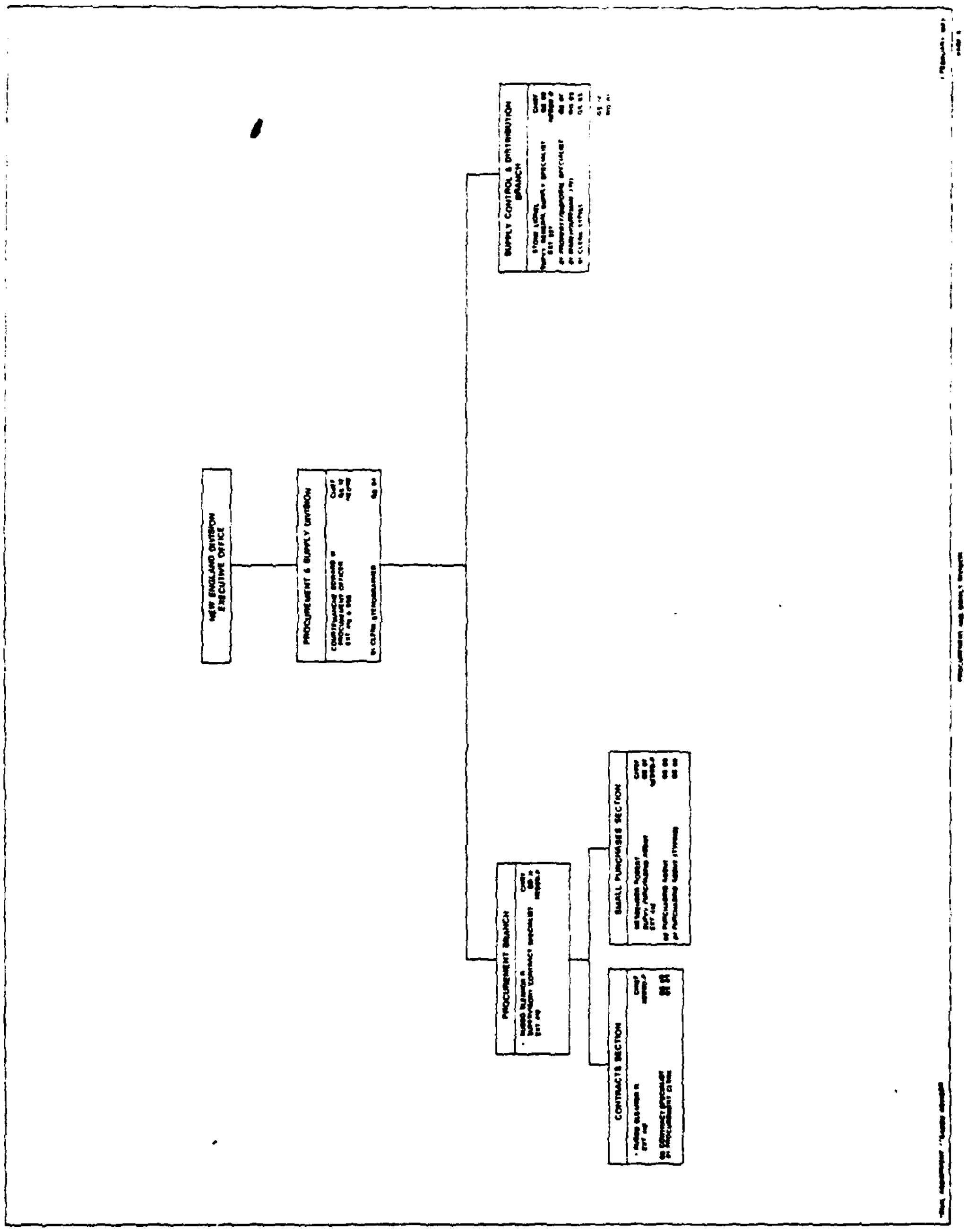
EXECUTIVE OFFICE
CONSTRUCTION DIVISION
ASSISTANT CHIEF
SUPERVISION AND INSPECTION BRANCH
EPA SUPPORT BRANCH
CONTRACT ADMINISTRATION BRANCH
CIVIL ENGINEER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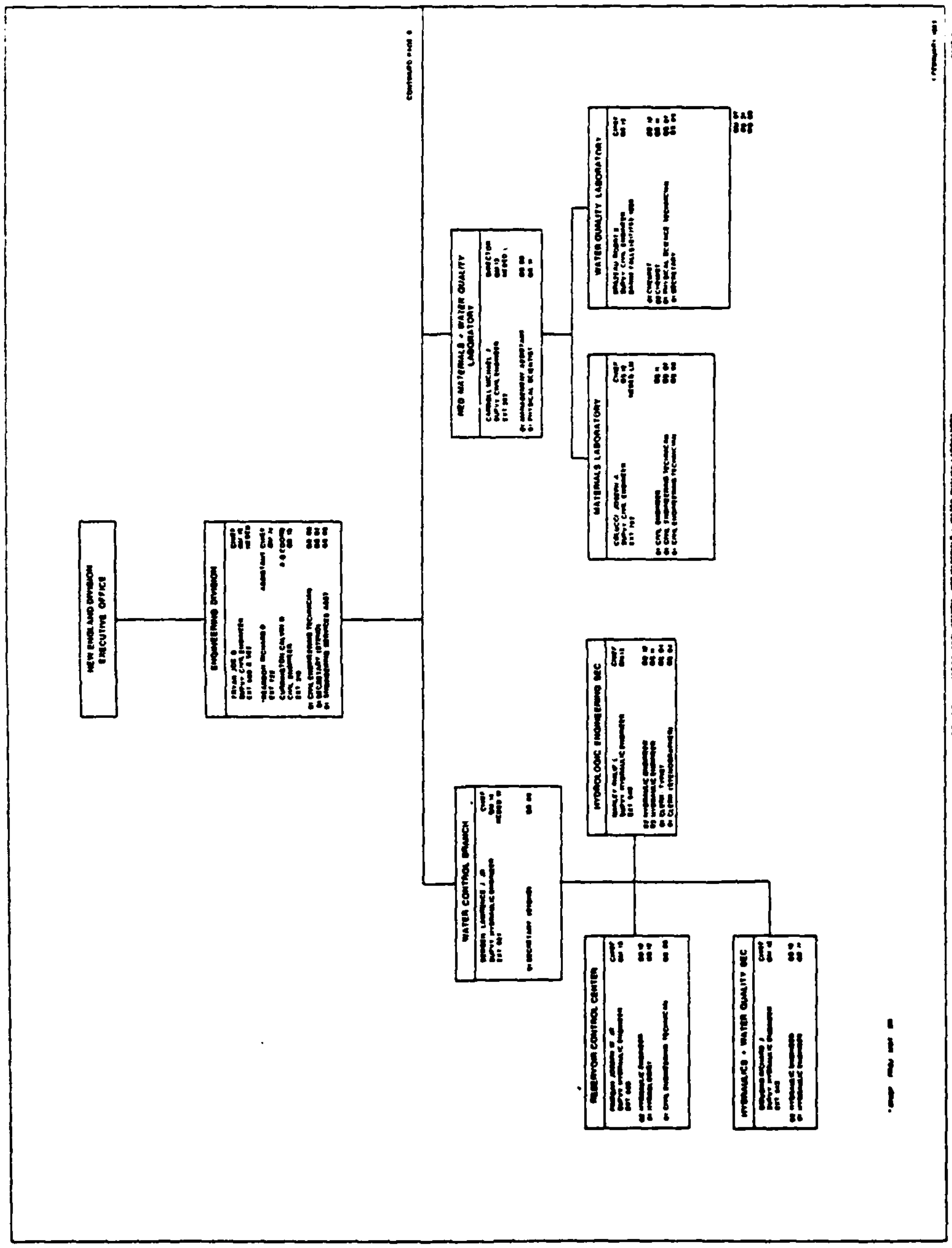
PROCUREMENT & SUPPLY DIVISION
SUPPLY CONTROL & DISTRIBUTION BRANCH
PROCUREMENT BRANCH
SMALL PURCHASES SECTION
CONTRACTS SECTION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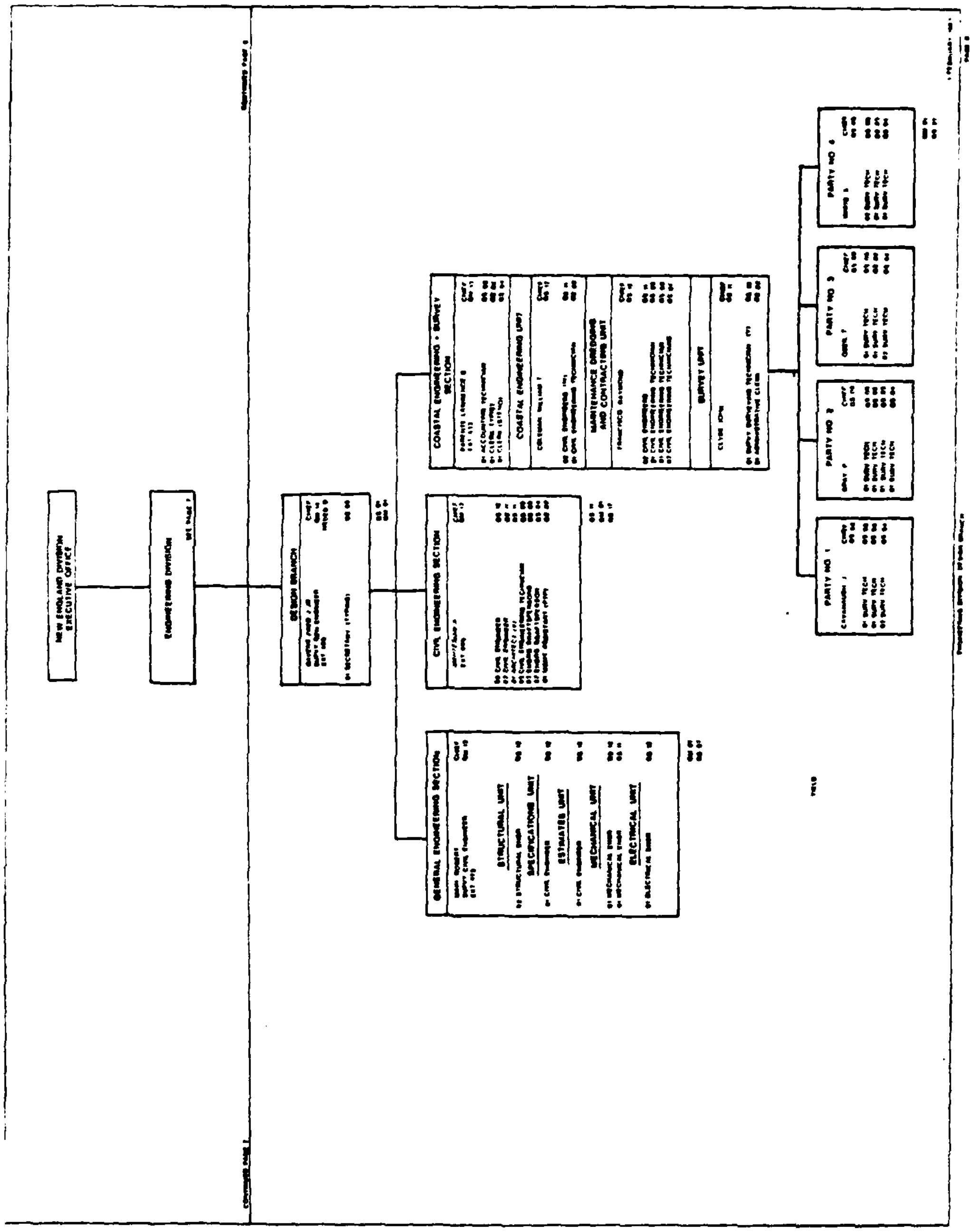
ENGINEERING DIVISION
WATER CONTROL BRANCH
HYDROLOGIC ENGINEERING SEC
RESERVOIR CONTROL CENTER
HYDRAULICS & WATER QUALITY SEC
NED MATERIALS & WATER QUALITY LABORATORY
MATERIALS LABORATORY
WATER QUALITY LABORATORY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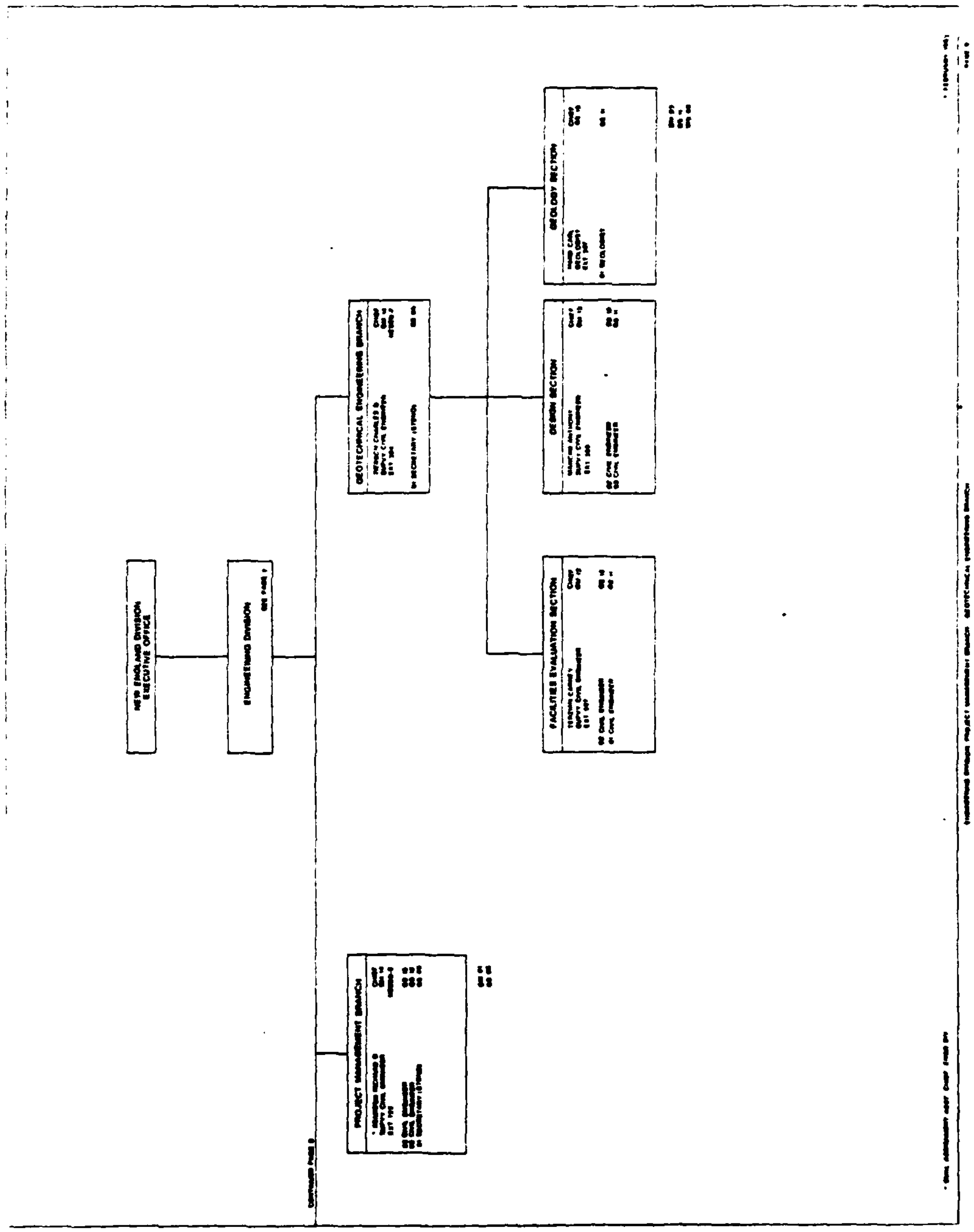
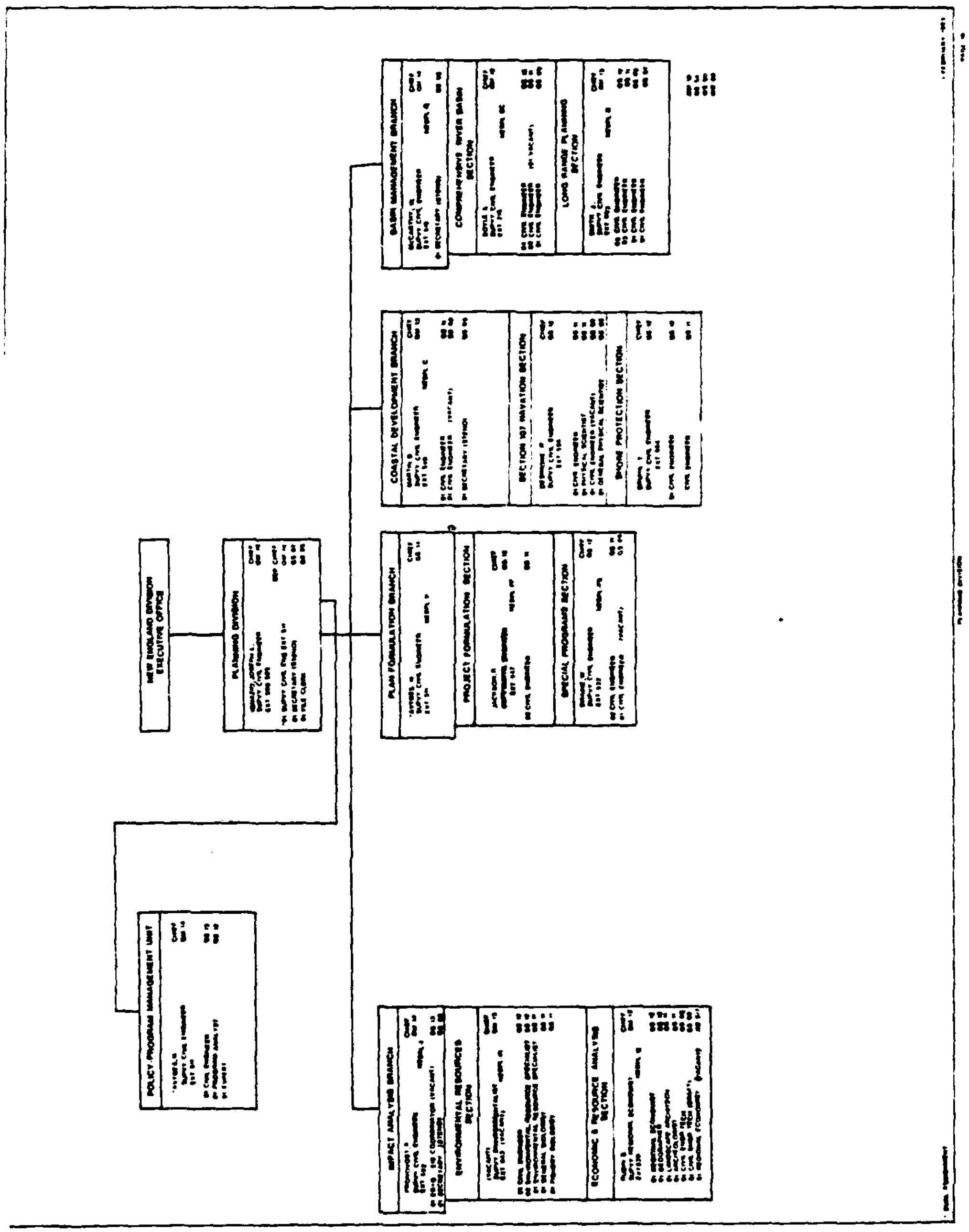
ENGINEERING DIVISION
DESIGN BRANCH
GENERAL ENGINEERING SECTION
STRUCTURAL UNIT
SPECIFICATIONS UNIT
ESTIMATES UNIT
MECHANICAL UNIT
ELECTRICAL UNIT
CIVIL ENGINEERING SECTION
COASTAL ENGINEERING + SURVEY SECTION
COASTAL ENGINEERING UNIT
MAINTENANCE DREDGING AND CONTRACTING UNIT
SURVEY UNIT
PARTY NO 1
PARTY NO 2
PARTY NO 3
PARTY NO 4


NEW ENGLAND DIVISION
EXECUTIVE OFFICE
ENGINEERING DIVISION
PROJECT MANAGEMENT BRANCH
GEOTECHNICAL ENGINEERING BRANCH
FACILITIES EVALUATION SECTION
DESIGN SECTION
GEOLOGY SECTION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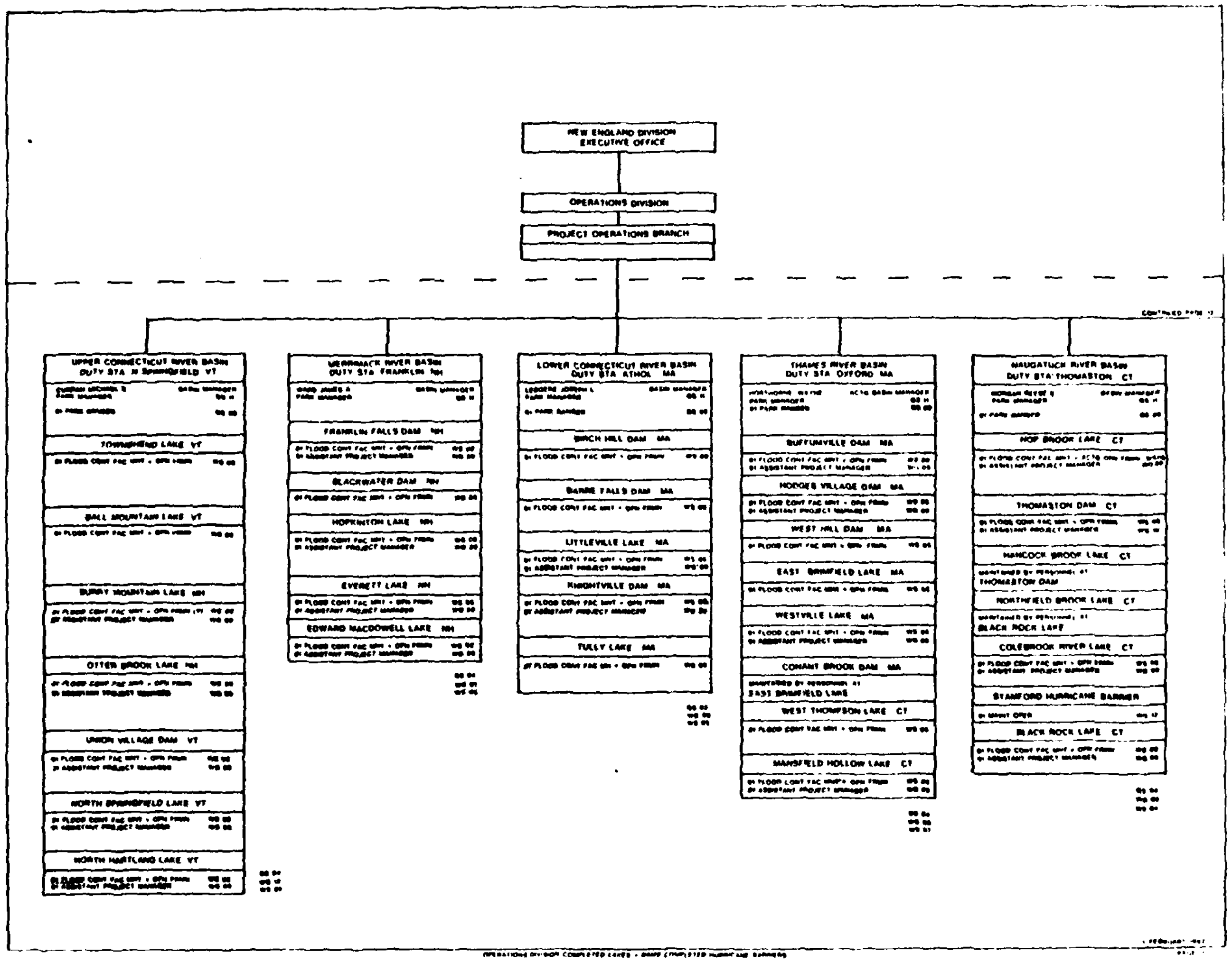
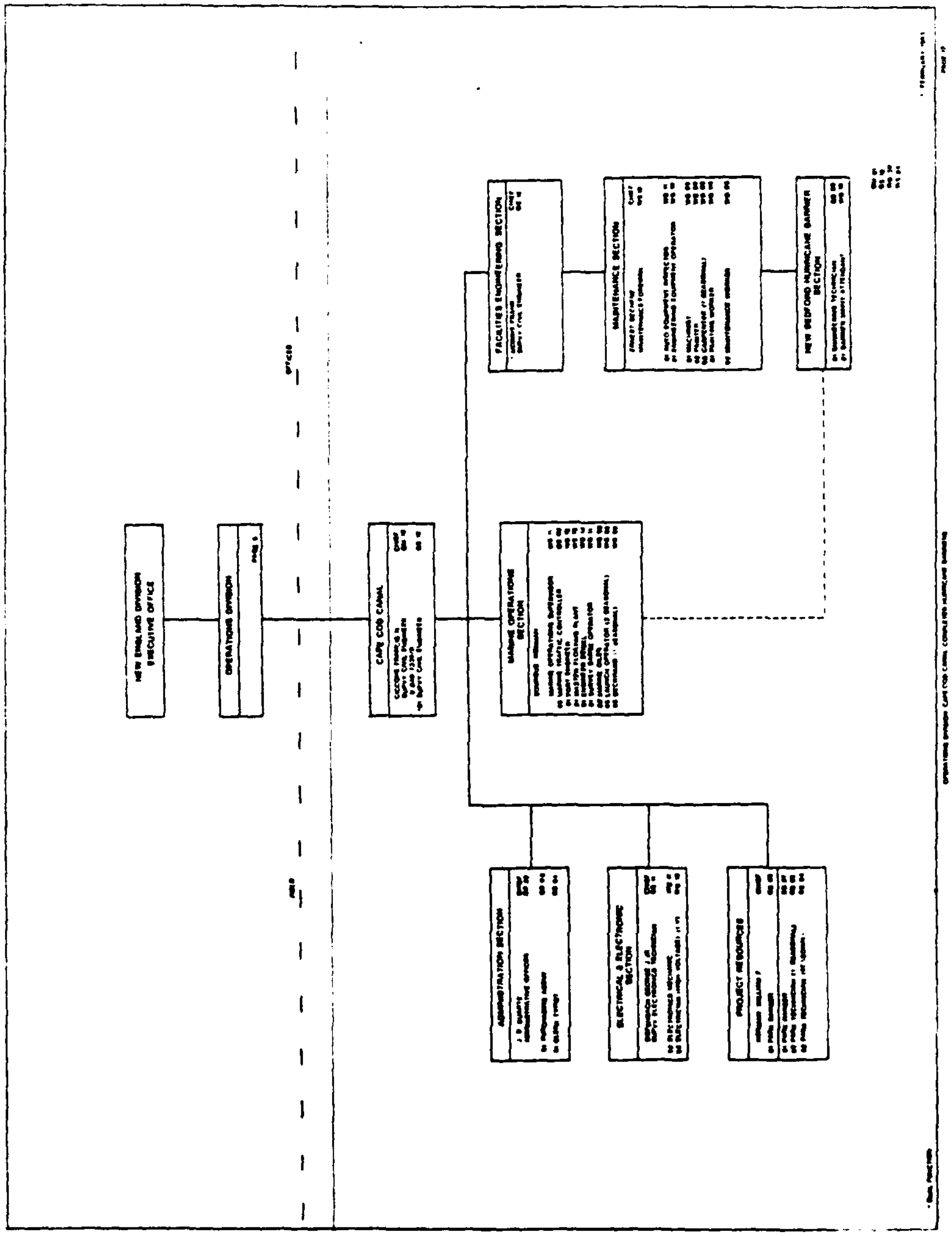
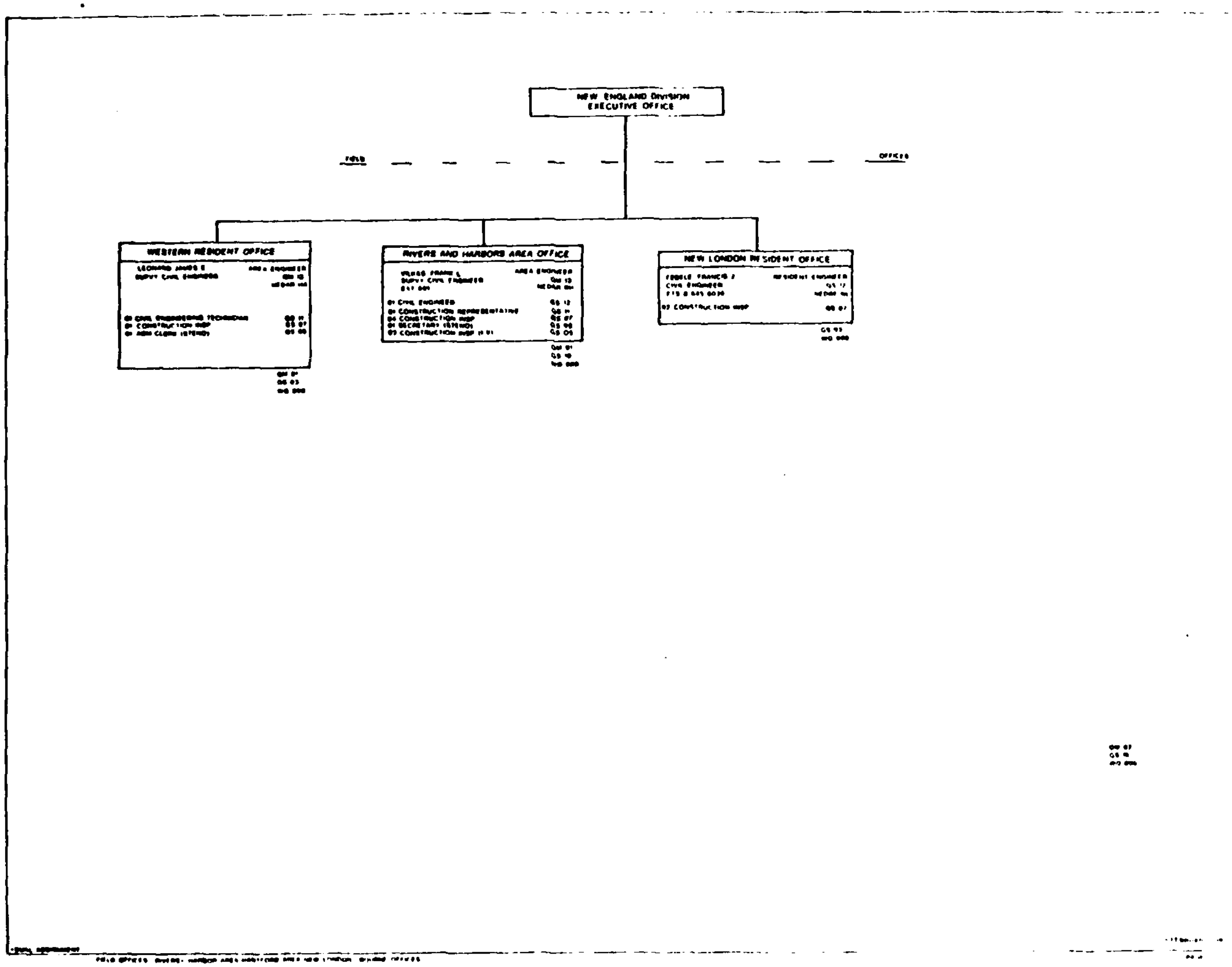
PLANNING DIVISION
POLICY-PROGRAM MANAGEMENT UNIT
IMPACT ANALYSIS BRANCH
ENVIRONMENTAL RESOURCES SECTION
ECONOMIC & RESOURCE ANALYSIS SECTION
PLAN FORMULATION BRANCH
PROJECT FORMULATION SECTION
SPECIAL PROGRAMS SECTION
COASTAL DEVELOPMENT BRANCH
SECTION 107 NAVIGATION SECTION
SHORE PROTECTION SECTION
BASIN MANAGEMENT BRANCH
COMPREHENSIVE RIVER BASIN SECTION
LONG RANGE PLANNING SECTION


NEW ENGLAND DIVISION
EXECUTIVE OFFICE
OPERATIONS DIVISION
PROJECT OPERATIONS BRANCH
UPPER CONNECTICUT RIVER BASIN
DUTY STA N SPRINGFIELD VT
TOWNSHEND LAKE VT
BALL MOUNTAIN LAKE VT
SURRY MOUNTAIN LAKE NH
OTTER BROOK LAKE NH
UNION VILLAGE DAM VT
NORTH SPRINGFIELD LAKE VT
NORTH HARTLAND LAKE VT
MERRIMACK RIVER BASIN
DUTY STA FRANKLIN NH
FRANKLIN FALLS DAM NH
BLACKWATER DAM NH
HOPKINTON LAKE NH
EVERETT LAKE NH
EDWARD MACDOWELL LAKE NH
LOWER CONNECTICUT RIVER BASIN
DUTY STA ATHOL MA
BIRCH HILL DAM MA
BARRE FALLS DAM MA
LITTLEVILLE LAKE MA
KNIGHTVILLE DAM MA
TULLY LAKE MA
THAMES RIVER BASIN
DUTY STA OXFORD MA
BUFFUMVILLE DAM MA
HODGES VILLAGE DAM MA
WEST HILL DAM MA
EAST BRIMFIELD LAKE MA
WESTVILLE LAKE MA
CONANT BROOK DAM MA
EAST BRIMFIELD LAKE
WEST THOMPSON LAKE CT
MANSFIELD HOLLOW LAKE CT
NAUGATUCK RIVER BASIN
DUTY STA THOMASTON CT
HOP BROOK LAKE CT
THOMASTON DAM CT
HANCOCK BROOK LAKE CT
THOMASTON DAM
NORTHFIELD BROOK LAKE CT
BLACK ROCK LAKE
COLEBROOK RIVER LAKE CT
STAMFORD HURRICANE BARRIER
BLACK ROCK LAKE CT


NEW ENGLAND DIVISION EXECUTIVE OFFICE
OPERATIONS DIVISION
CAPE COD CANAL
MARINE OPERATIONS SECTION
FACILITIES ENGINEERING SECTION
MAINTENANCE SECTION
NEW BEDFORD HURRICANE BARRIER SECTION
ADMINISTRATION SECTION
ELECTRICAL & ELECTRONIC SECTION
PROJECT RESOURCES

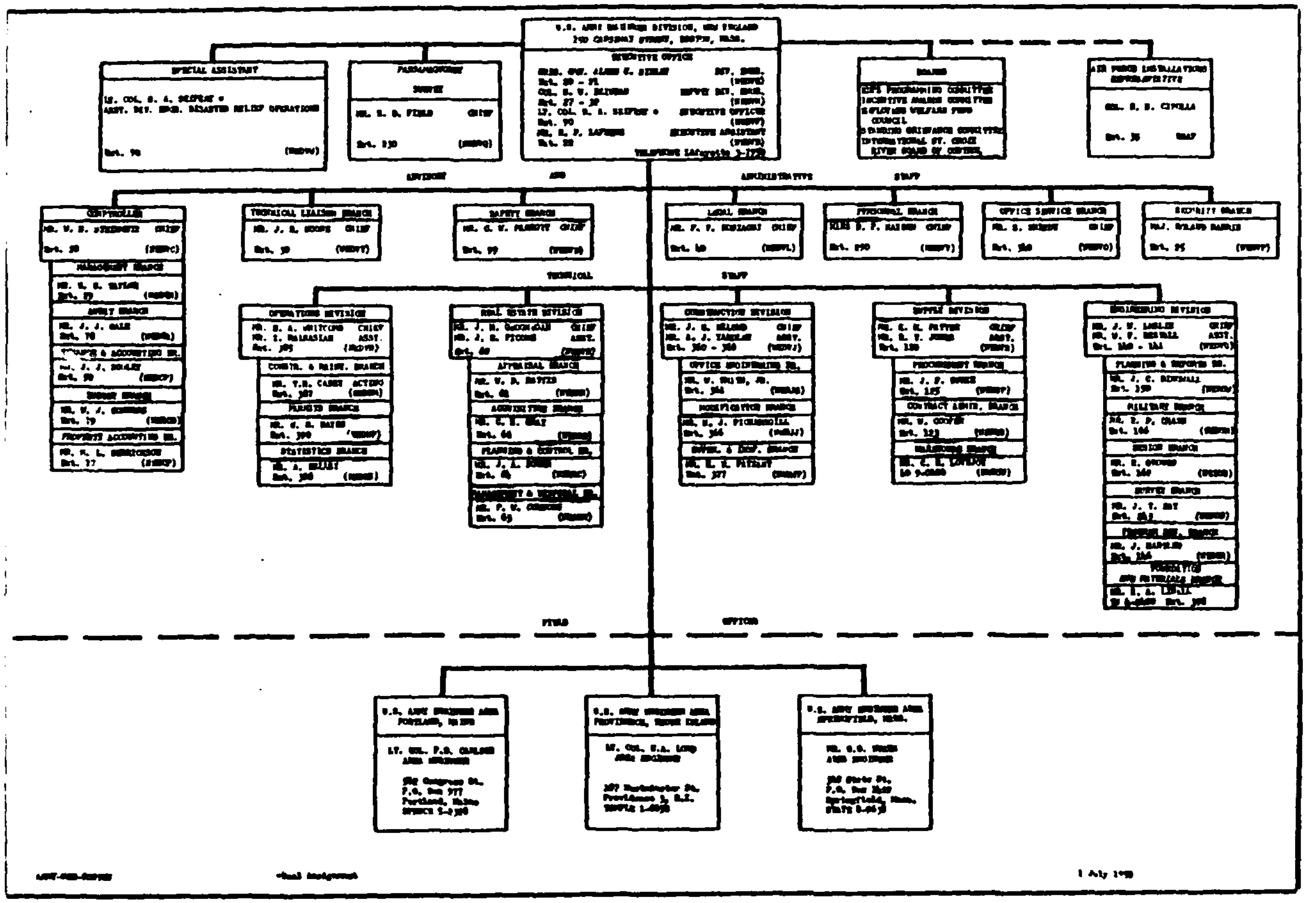


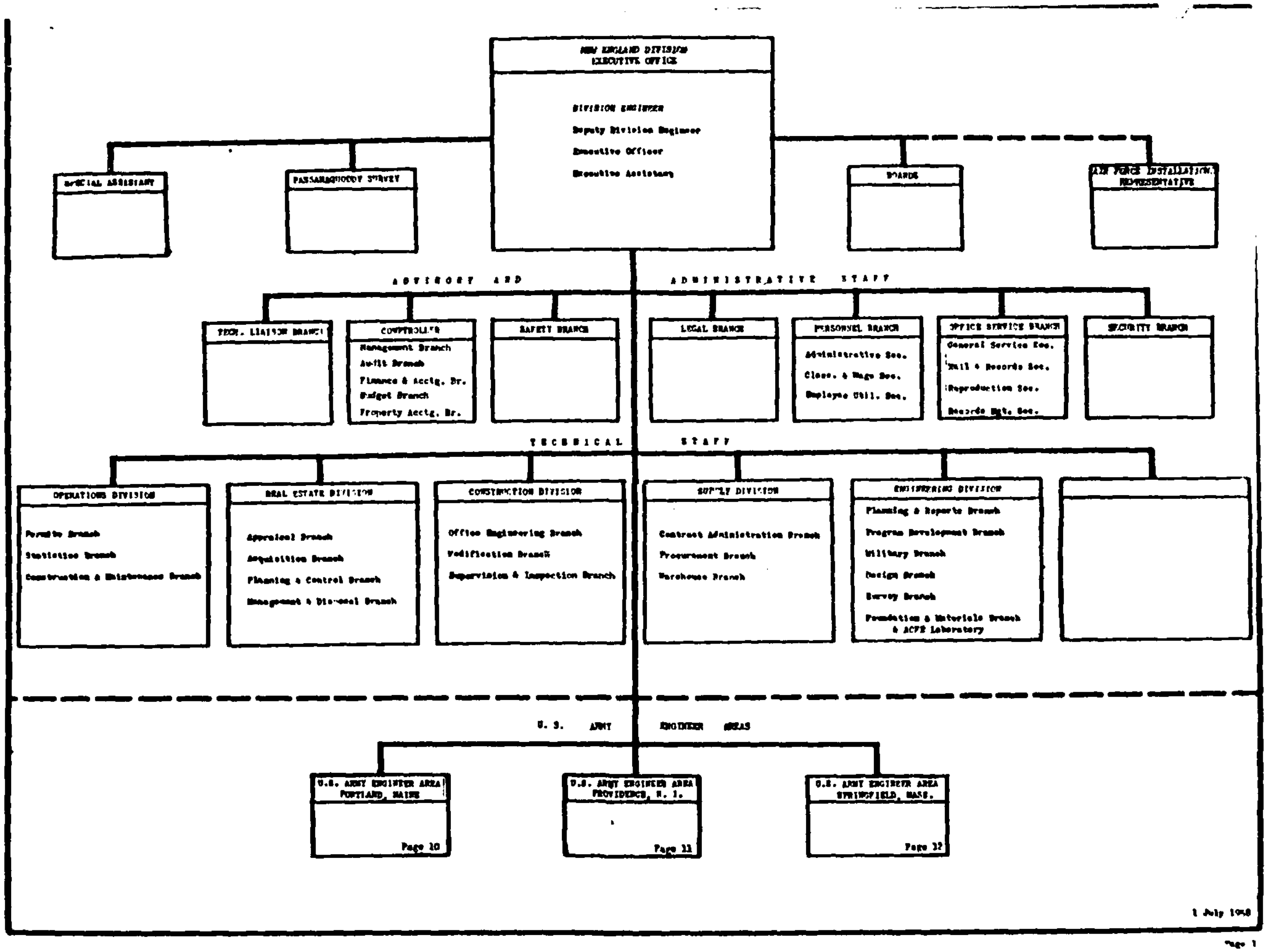
NEW ENGLAND DIVISION
EXECUTIVE OFFICE
FIELD
OFFICES
WESTERN RESIDENT OFFICE
RIVERS AND HARBORS AREA OFFICE
NEW LONDON RESIDENT OFFICE

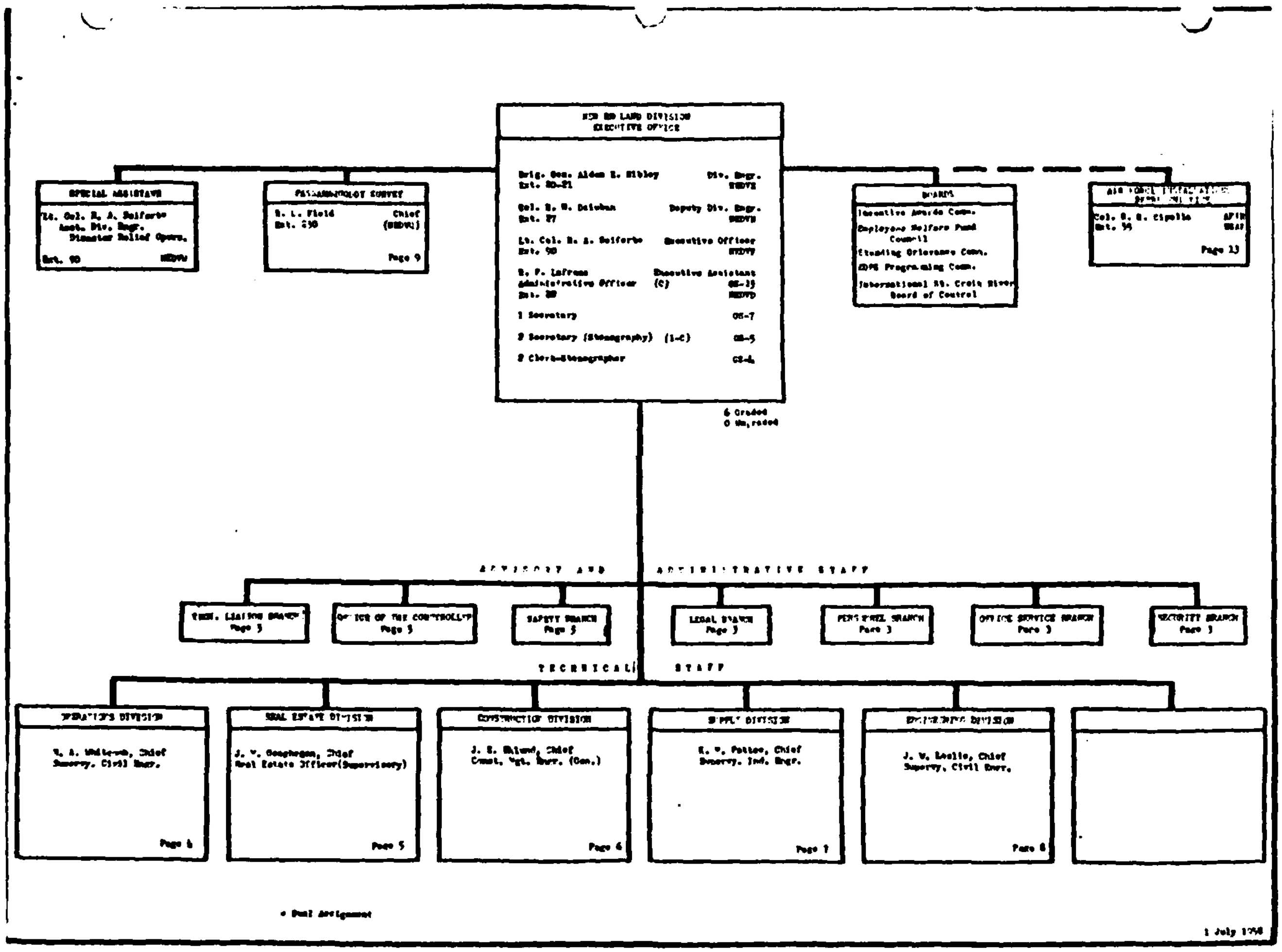
APPENDIX B

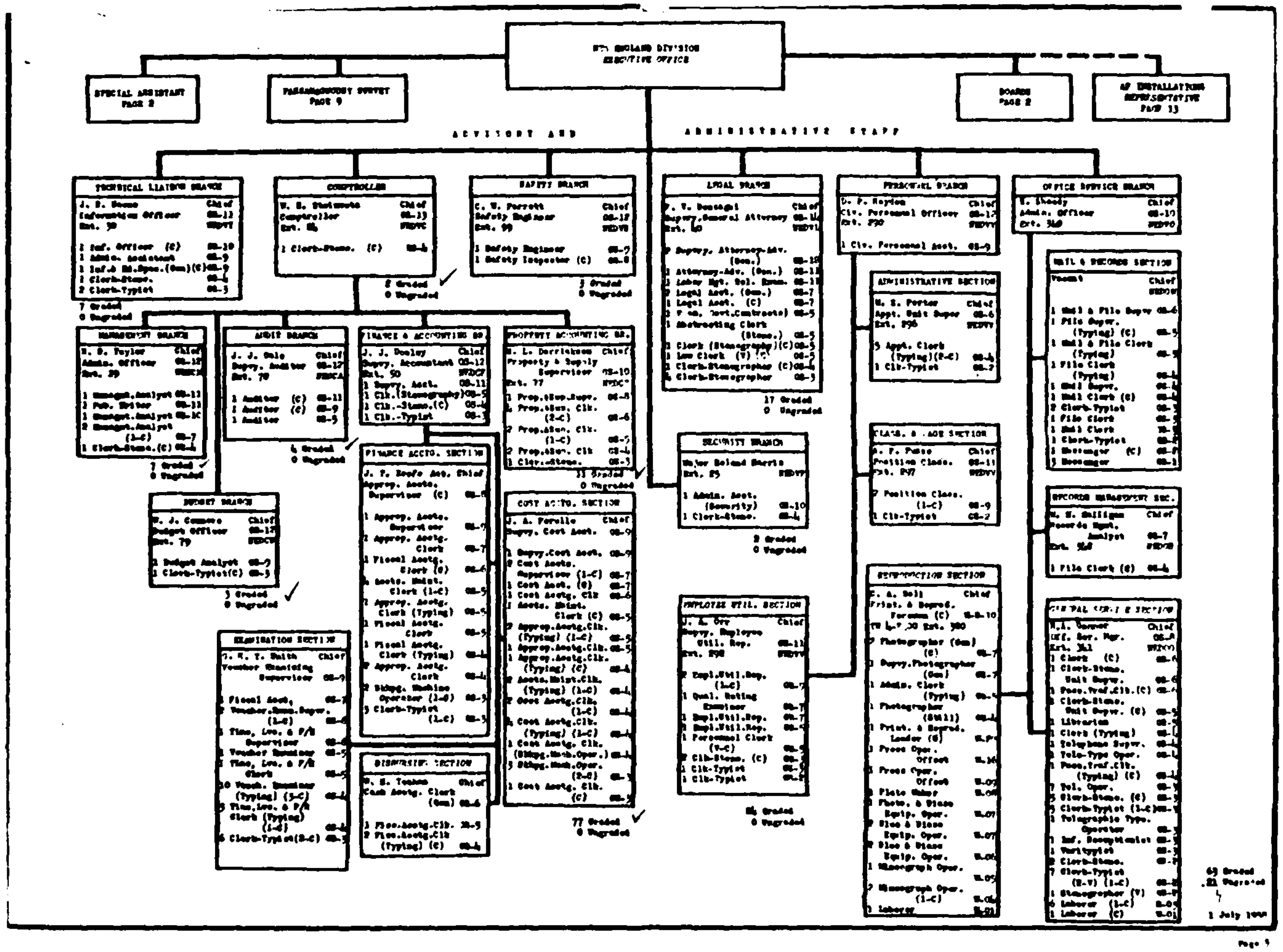
Organization Chart

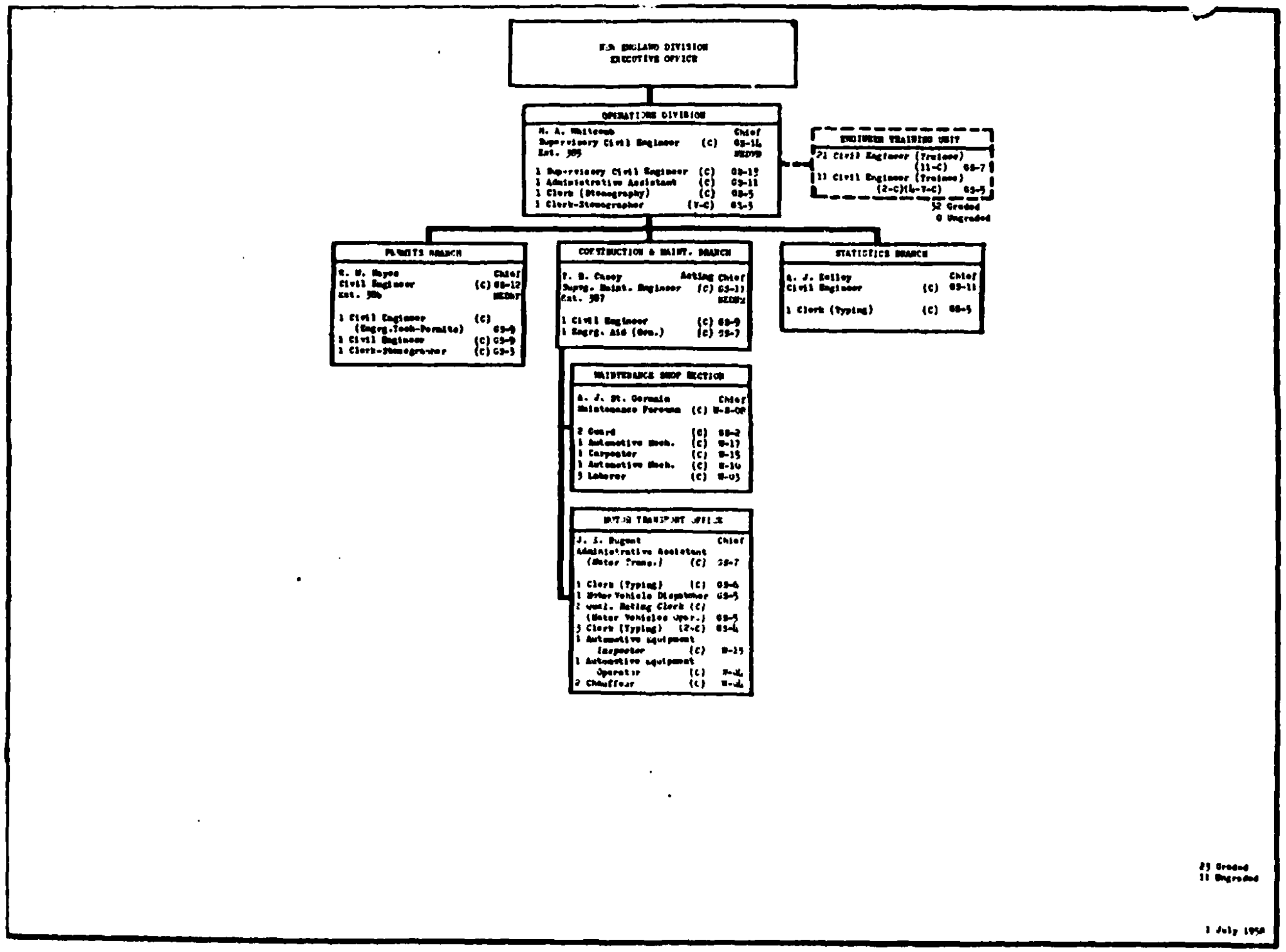
1 July 1958

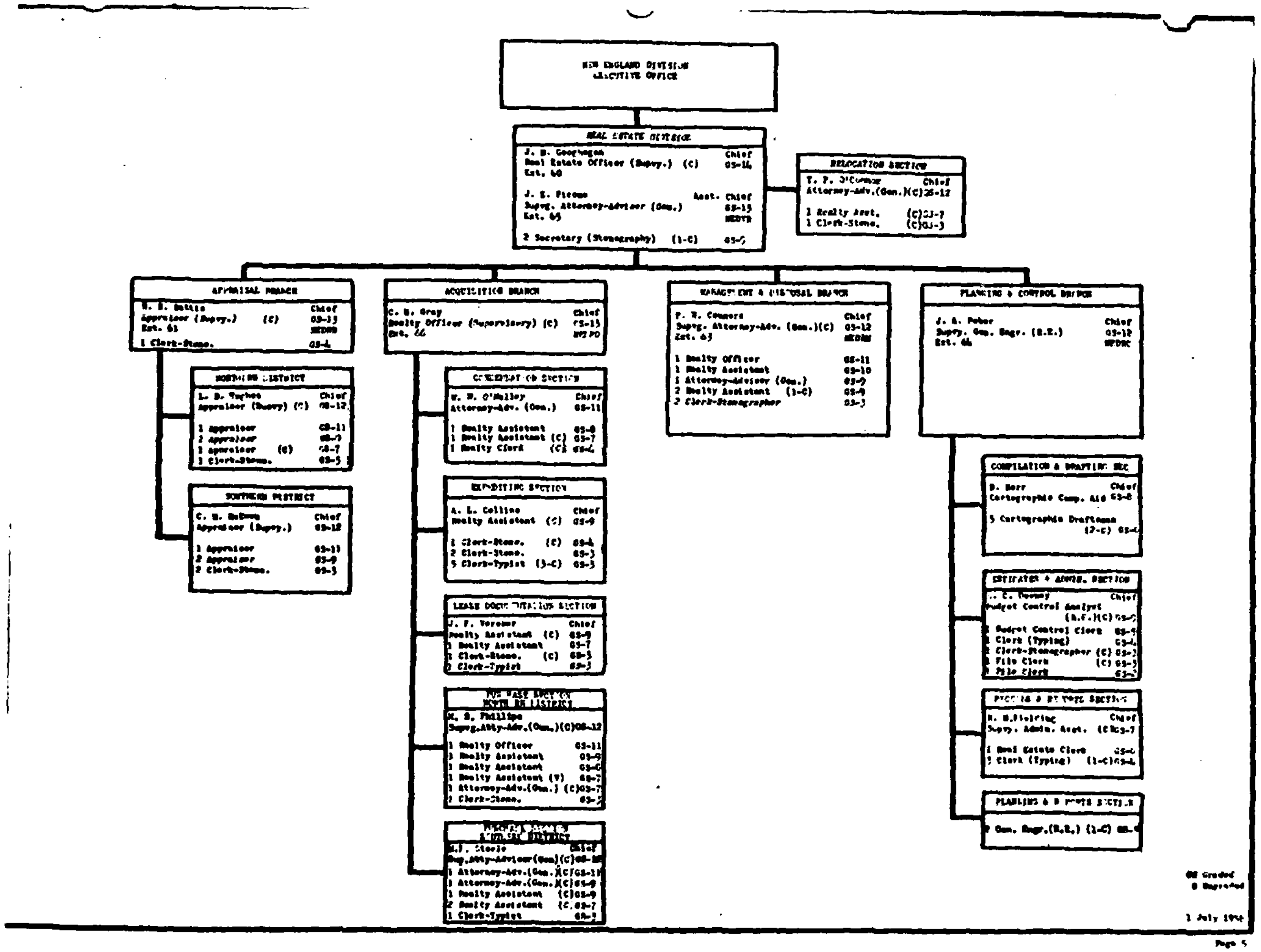

SPECIAL ASSISTANT
EXECUTIVE OFFICE
BOARDS
ADVISORY
AND
ADMINISTRATIVE
STAFF
CONTROLLER
TECHNICAL LIAISON BRANCH
SAFETY BRANCH
LEGAL BRANCH
PERSONNEL BRANCH
OFFICE SERVICE BRANCH
SECURITY BRANCH
TECHNICAL
STAFF
OPERATIONS DIVISION
REAL ESTATE DIVISION
CONSTRUCTION DIVISION
SUPPLY DIVISION
ENGINEERING DIVISION
FIELD
OFFICES

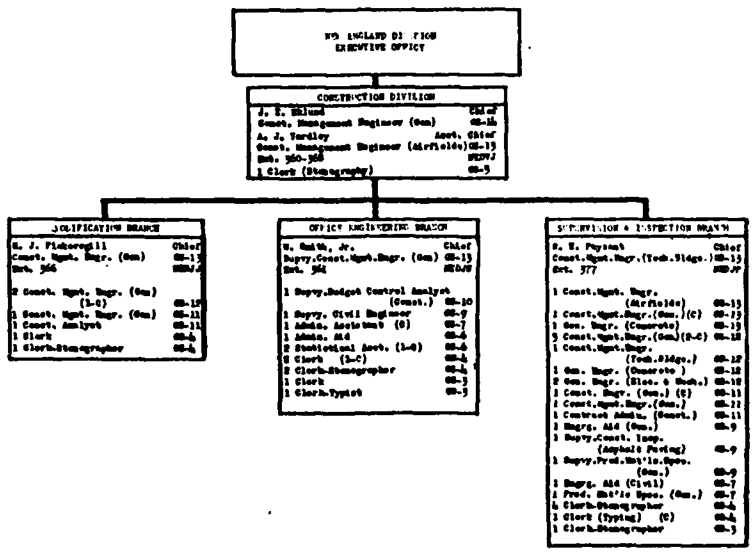

NEW ENGLAND DIVISION
EXECUTIVE OFFICE
DIVISION ENGINEER
Deputy Division Engineer
Executive Officer
Executive Assistant
SPECIAL ASSISTANT
PASSAMAQUODDY SURVEY
BOARDS
AIR FORCE INSTALLATION REPRESENTATIVE
ADVISORY AND ADMINISTRATIVE STAFF
TECH. LIAISON BRANCH
COMPTROLLER
Management Branch
Audit Branch
Finance & Acctg. Br.
Budget Branch
Property Acctg. Br.
SAFETY BRANCH
LEGAL BRANCH
PERSONNEL BRANCH
Administrative Sec.
Class. & Wage Sec.
Employee Util. Sec.
OFFICE SERVICE BRANCH
General Service Sec.
Mail & Records Sec.
Reproduction Sec.
Records Mgt. Sec.
SECURITY BRANCH
TECHNICAL STAFF
OPERATIONS DIVISION
Permits Branch
Statistics Branch
Construction & Maintenance Branch
REAL ESTATE DIVISION
Appraisal Branch
Acquisition Branch
Planning & Control Branch
Management & Disposal Branch
CONSTRUCTION DIVISION
Office Engineering Branch
Modification Branch
Supervision & Inspection Branch
SUPPLY DIVISION
Contract Administration Branch
Procurement Branch
Warehouse Branch
ENGINEERING DIVISION
Planning & Reports Branch
Program Development Branch
Military Branch
Design Branch
Survey Branch
Foundation & Materials Branch & ACFE Laboratory
U. S. ARMY ENGINEER AREAS
U.S. ARMY ENGINEER AREA PORTLAND, MAINE
Page 10
U.S. ARMY ENGINEER AREA PROVIDENCE, R. I.
Page 11
U.S. ARMY ENGINEER AREA SPRINGFIELD, MASS.
Page 12
1 July 1958
Page 1

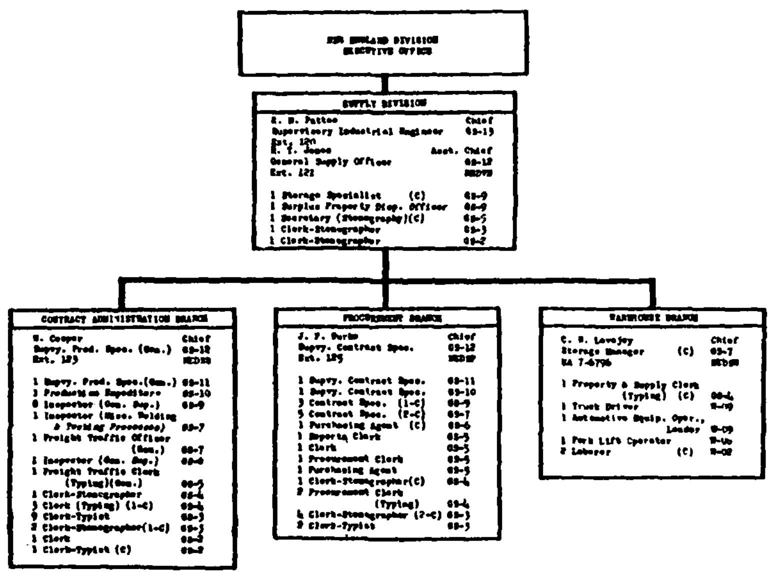

EXECUTIVE OFFICE
Brig. Gen. Alden K. Sibley
Div. Engr.
Deputy Div. Engr.
Executive Officer
Executive Assistant
Administrative Officer
1 Secretary
Secretary (Stenography)
Clerk-Stenographer
6 Graded
0 Ungraded
SPECIAL ASSISTANT
Disaster Relief Opers.
Chief
Page 9
BOARDS
Incentive Awards Comm.
Employees Welfare Fund Council
Standing Grievance Comm.
International St. Croix River Board of Control
Page 13
ADVISORY AND ADMINISTRATIVE STAFF
TECH. LIAISON BRANCH
OFFICE OF THE COMPTROLLER
SAFETY BRANCH
LEGAL BRANCH
PERSONNEL BRANCH
OFFICE SERVICE BRANCH
SECURITY BRANCH
TECHNICAL STAFF
OPERATIONS DIVISION
REAL ESTATE DIVISION
CONSTRUCTION DIVISION
SUPPLY DIVISION
ENGINEERING DIVISION
Real Estate Officer (Supervisory)
Page 4
Page 5
Page 6
Page 7
Page 8
* Dual Assignment
1 July 1958


ADVISORY AND ADMINISTRATIVE STAFF
SPECIAL ASSISTANT
BOARDS
TECHNICAL LIAISON BRANCH
COMPTROLLER
SAFETY BRANCH
LEGAL BRANCH
PERSONNEL BRANCH
OFFICE SERVICE BRANCH
MANAGEMENT BRANCH
AUDIT BRANCH
BUDGET BRANCH
SECURITY BRANCH
ADMINISTRATIVE SECTION
MAIL & RECORDS SECTION
RECORDS MANAGEMENT SEC.
REPRODUCTION SECTION
EXAMINATION SECTION
FINANCE ACCTG. SECTION
COST ACCTG. SECTION
DISBURSING SECTION


N.E. ENGLAND DIVISION
EXECUTIVE OFFICE
OPERATIONS DIVISION
Chief
Supervisory Civil Engineer (C) GS-14
1 Supervisory Civil Engineer (C) GS-13
1 Administrative Assistant (C) GS-11
1 Clerk (Stenography) (C) GS-5
1 Clerk-Stenographer (V-C) GS-3
ENGINEER TRAINING UNIT
21 Civil Engineer (Trainee) (11-C) GS-7
11 Civil Engineer (Trainee) (2-C)(4-V-C) GS-5
32 Graded
0 Ungraded
PERMITS BRANCH
Chief
Civil Engineer (C) GS-12
1 Civil Engineer (C) (Engrg.Tech-Permits) GS-9
1 Civil Engineer (C) GS-9
1 Clerk-Stenographer (C) GS-3
CONSTRUCTION & MAINT. BRANCH
Acting Chief
Supvg. Maint. Engineer (C) GS-11
1 Civil Engineer (C) GS-9
1 Engrg. Aid (Gen.) (C) GS-7
STATISTICS BRANCH
Chief
Civil Engineer (C) GS-11
1 Clerk (Typing) (C) GS-5
MAINTENANCE SHOP SECTION
Chief
Maintenance Foreman (C)
2 Guard (C)
1 Automotive Mech. (C)
1 Carpenter (C)
1 Automotive Mech. (C)
3 Laborer (C)
MOTOR TRANSPORT OFFICE
Chief
Administrative Assistant (Motor Trans.) (C)
1 Clerk (Typing) (C)
1 Motor Vehicle Dispatcher
2 Clerk (Typing) (2-C)
1 Automotive Equipment Inspector (C)
1 Automotive Equipment Operator (C)
2 Chauffeur (C)
23 Graded
11 Ungraded
1 July 1958


REAL ESTATE DIVISION
RELOCATION SECTION
APPRAISAL BRANCH
ACQUISITION BRANCH
PLANNING & CONTROL BRANCH
SOUTHERN DISTRICT
EXPEDITING SECTION
COMPILATION & DRAFTING SEC
1 July 1946
Page 5

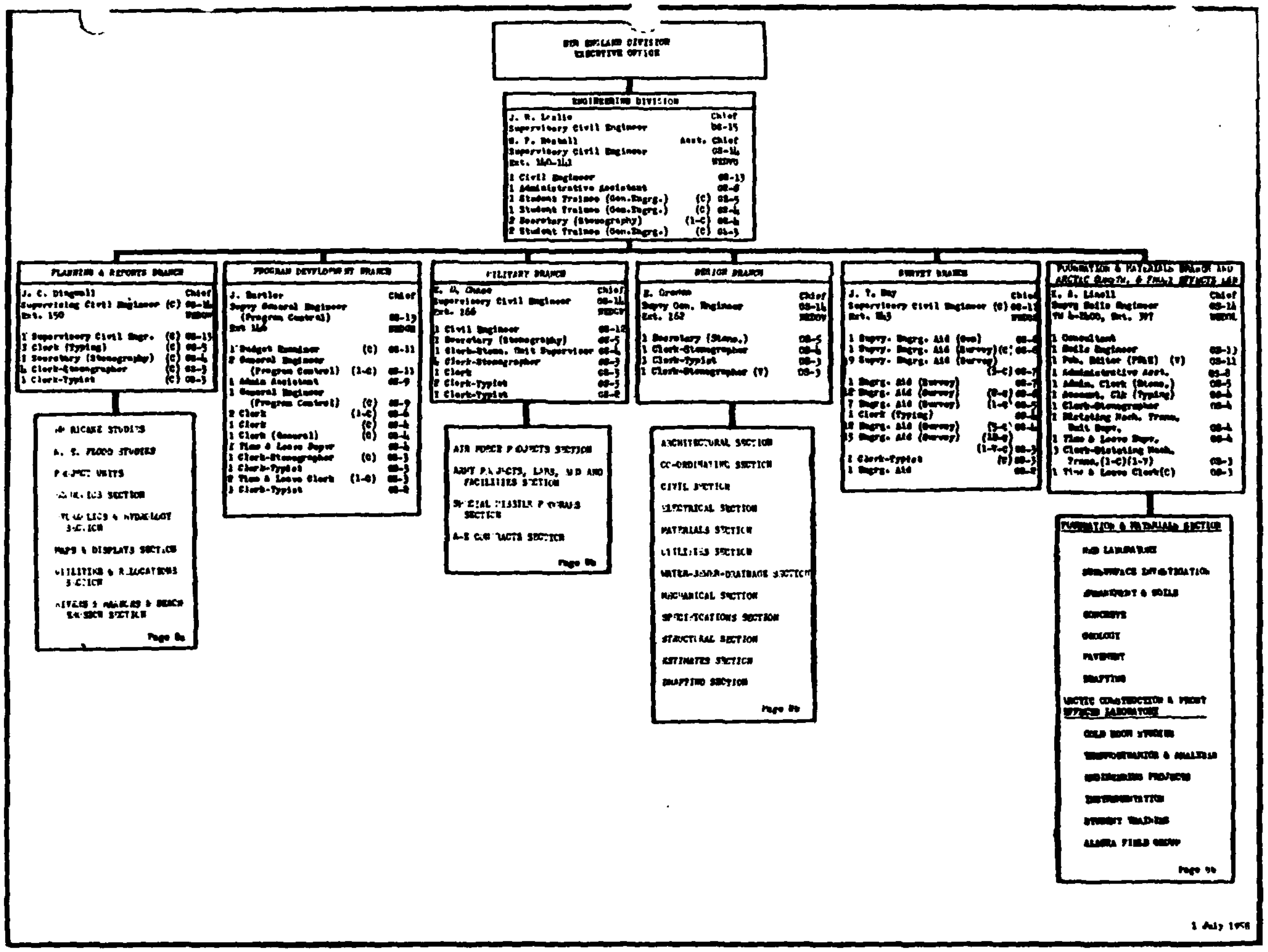

EXECUTIVE OFFICE
CONSTRUCTION DIVISION
A. J. Yardley
Asst. Chief
1 Clerk (Stenography)
OFFICE ENGINEERING BRANCH
Chief
1 Supvy. Budget Control Analyst
(Const.)
1 Supvy. Civil Engineer
1 Clerk
1 Clerk-Typist
SUPERVISION & INSPECTION BRANCH
Chief
1 Clerk-Stenographer

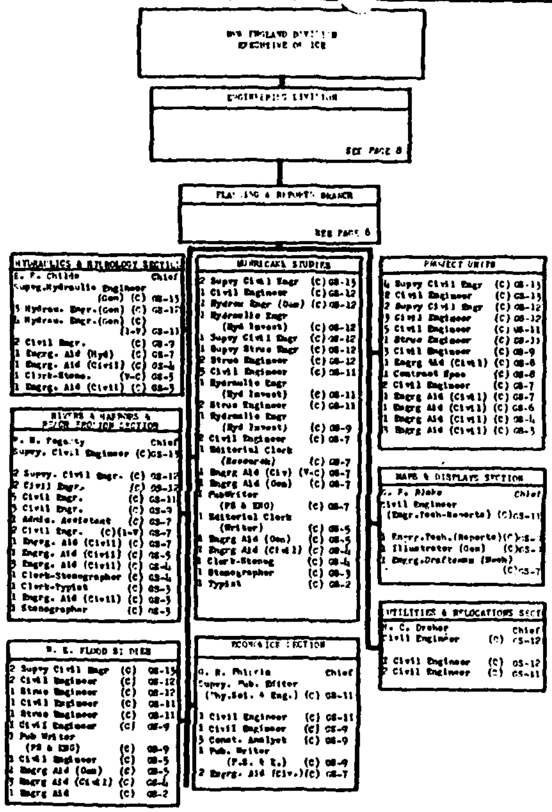


46 Graded
5 Ungraded

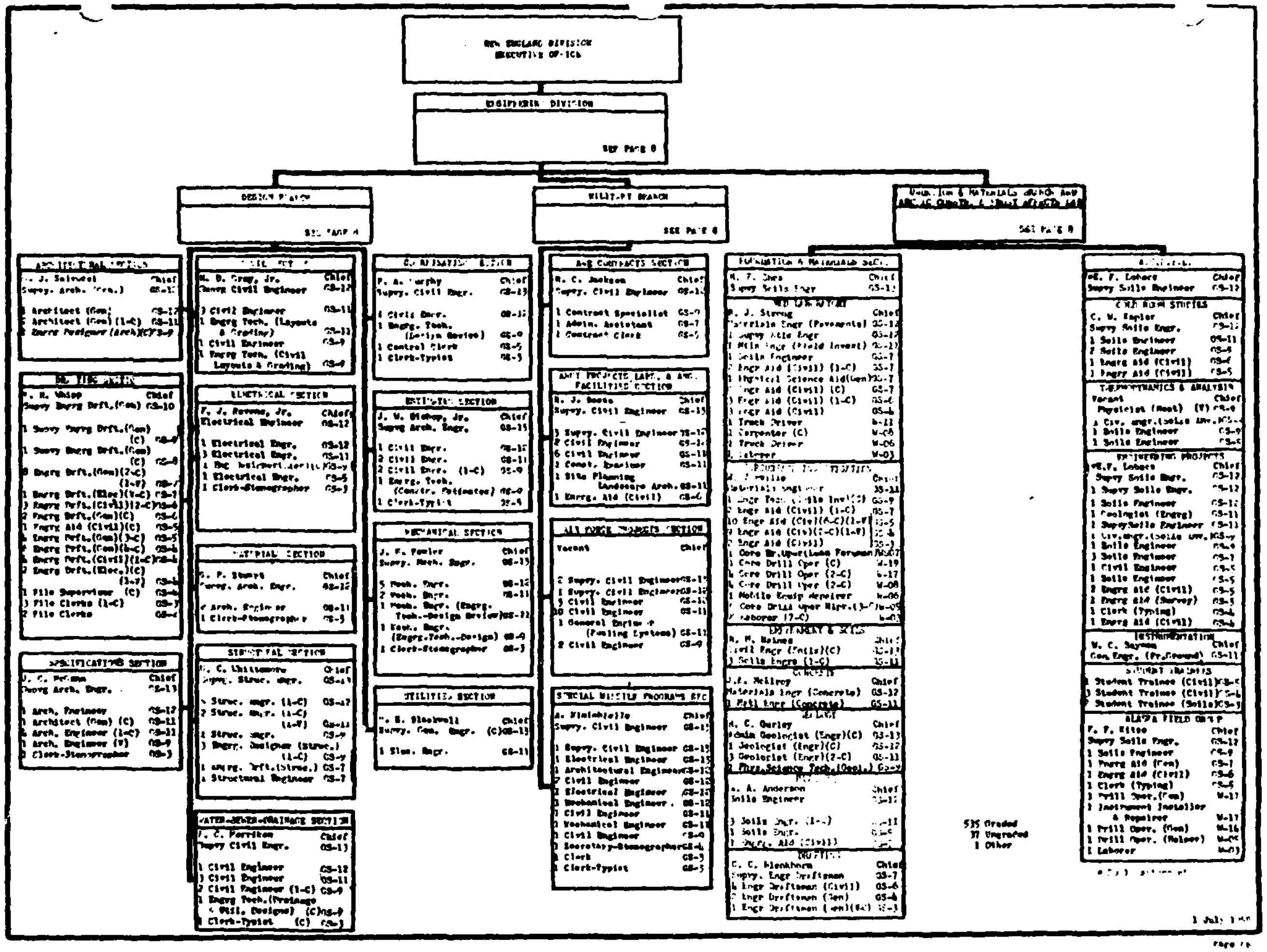
*Assignment in Defense Materials
System and as Small Business
Specialist

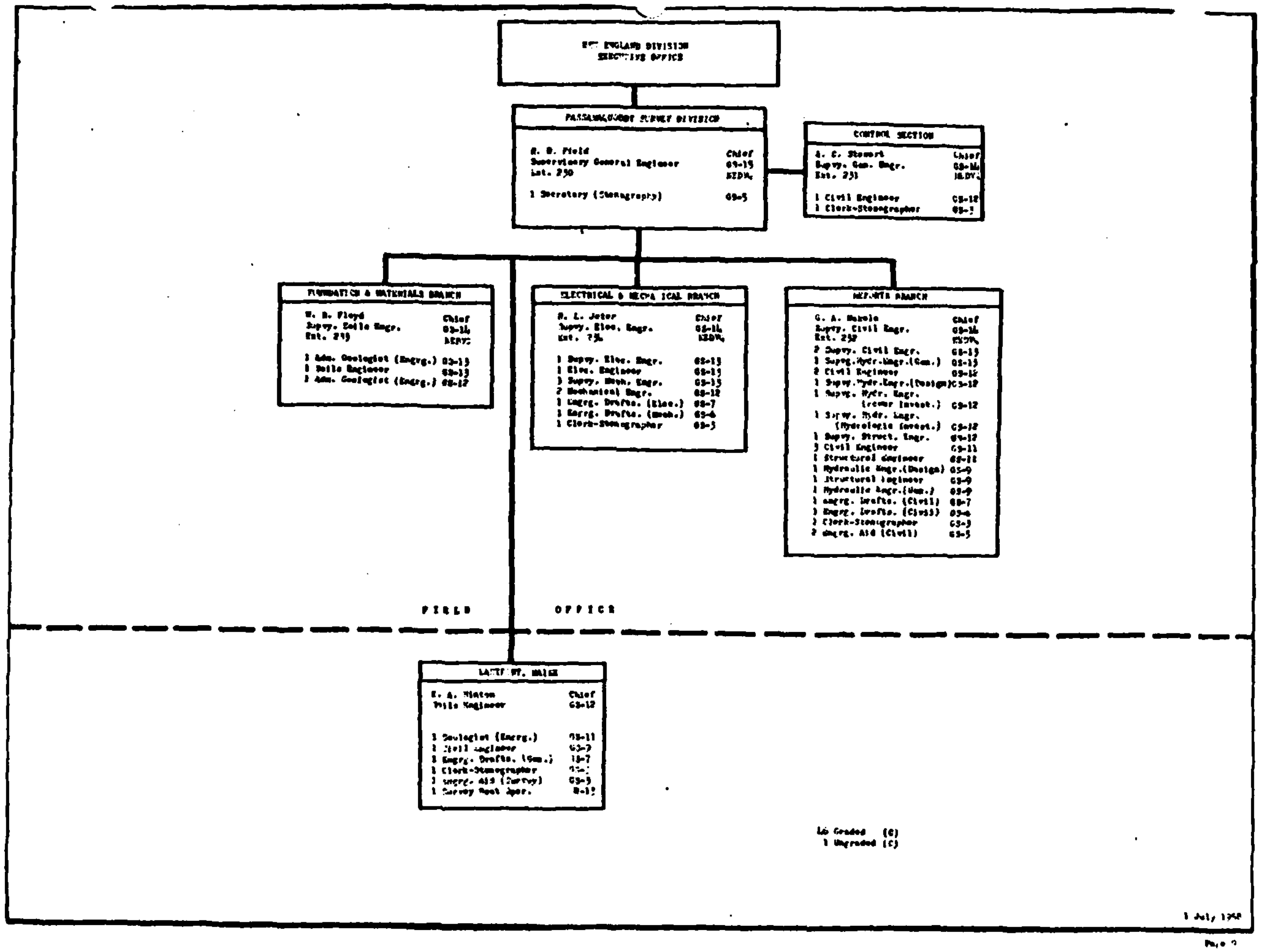
1 July 1958

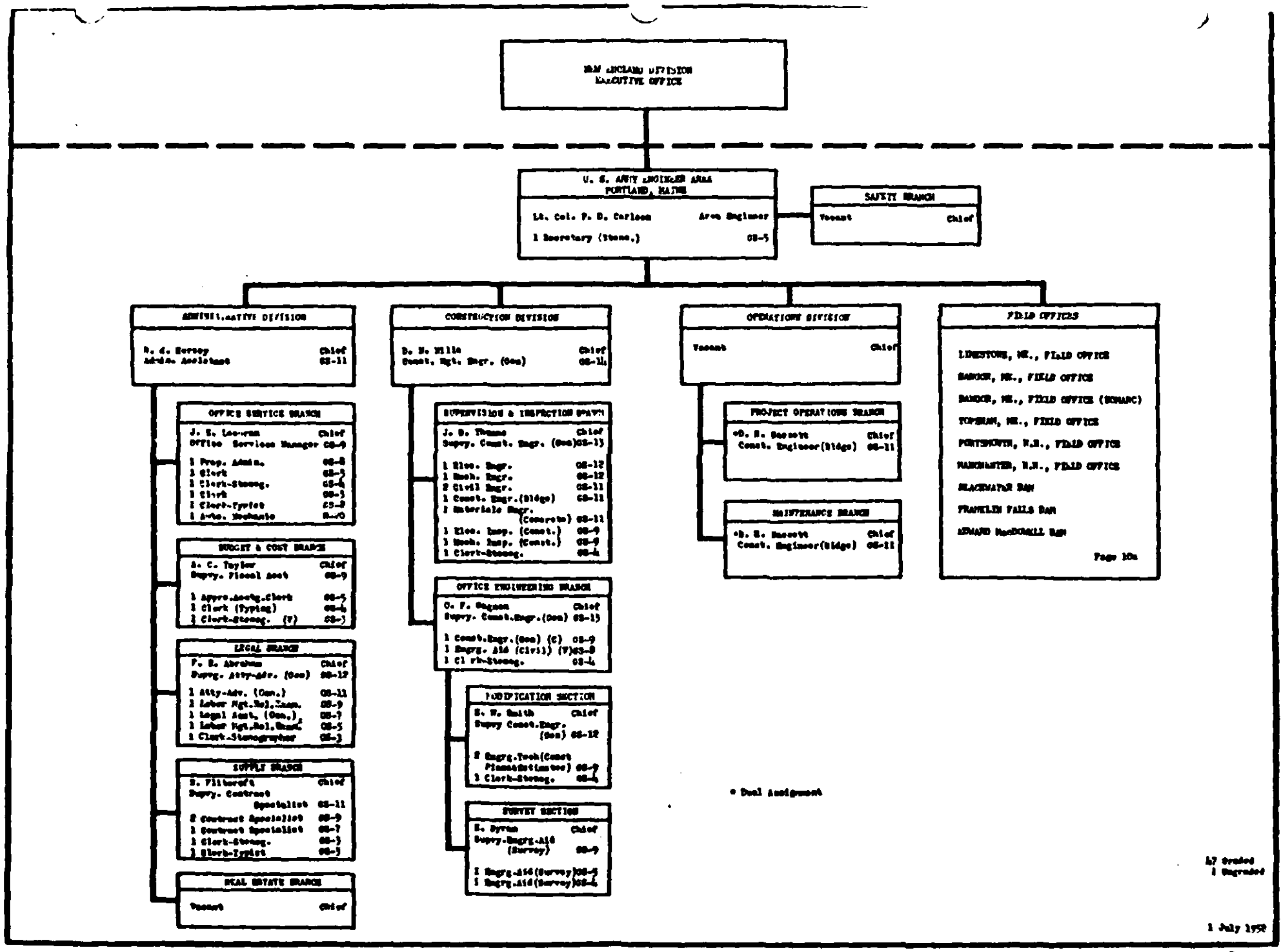

EXECUTIVE OFFICE
ENGINEERING DIVISION
Supervisory Civil Engineer
1 Civil Engineer
1 Administrative Assistant
PLANNING & REPORTS BRANCH
J. C. Dingwall
Chief
1 Clerk-Typist
PROGRAM DEVELOPMENT BRANCH
Chief
MILITARY BRANCH
Supervisory Civil Engineer
1 Civil Engineer
AIR FORCE PROJECTS SECTION
SECTION
A-E CONTRACTS SECTION
DESIGN BRANCH
Chief
ARCHITECTURAL SECTION
CO-ORDINATING SECTION
MATERIALS SECTION
MECHANICAL SECTION
STRUCTURAL SECTION
SURVEY BRANCH
Chief
1 Clerk (Typing)
Chief
1 Consultant
1 Administrative Asst.
1 Clerk-Stenographer
MAPS & DISPLAYS SECTION
Page 9b
1 July 1958

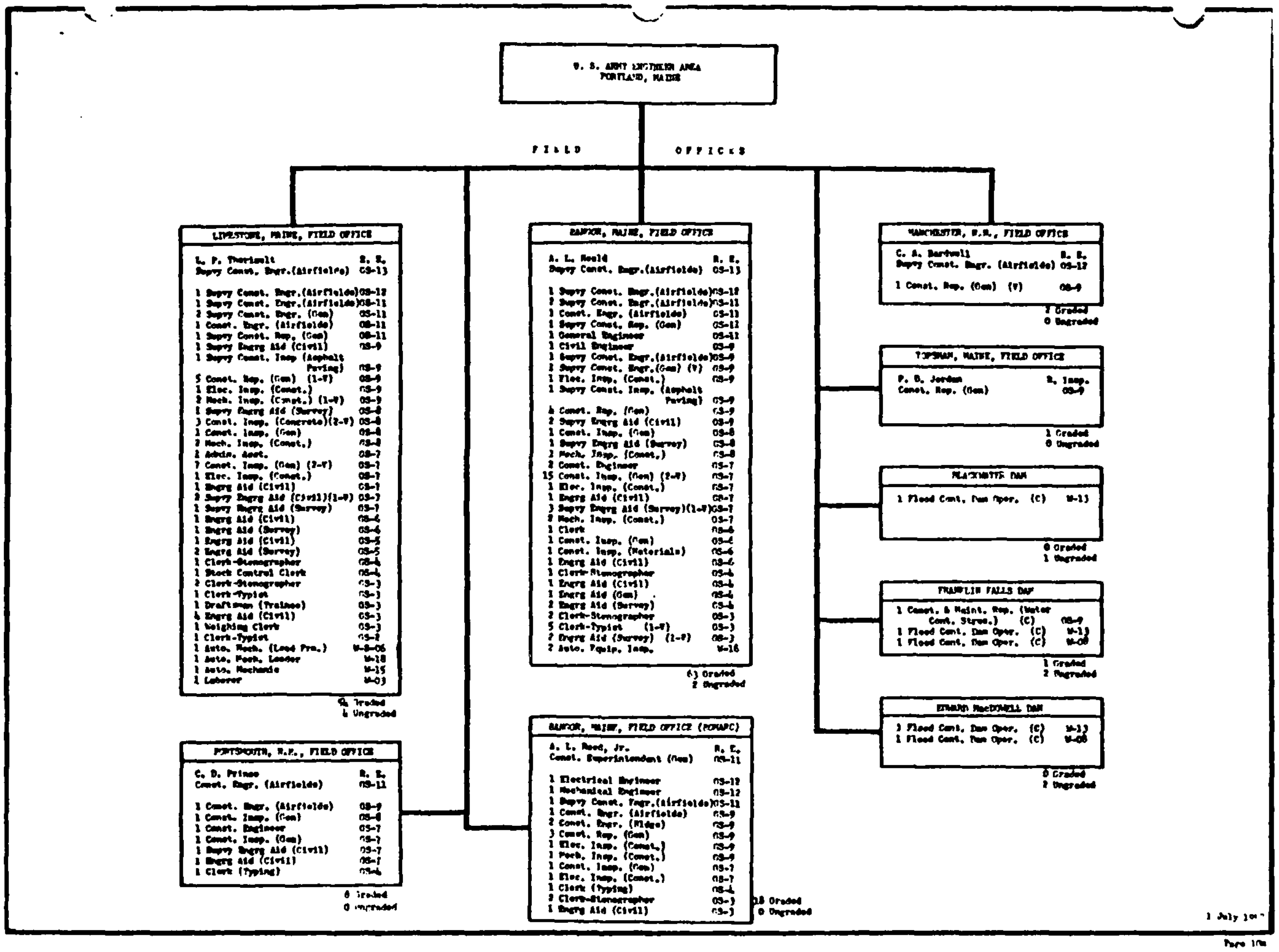


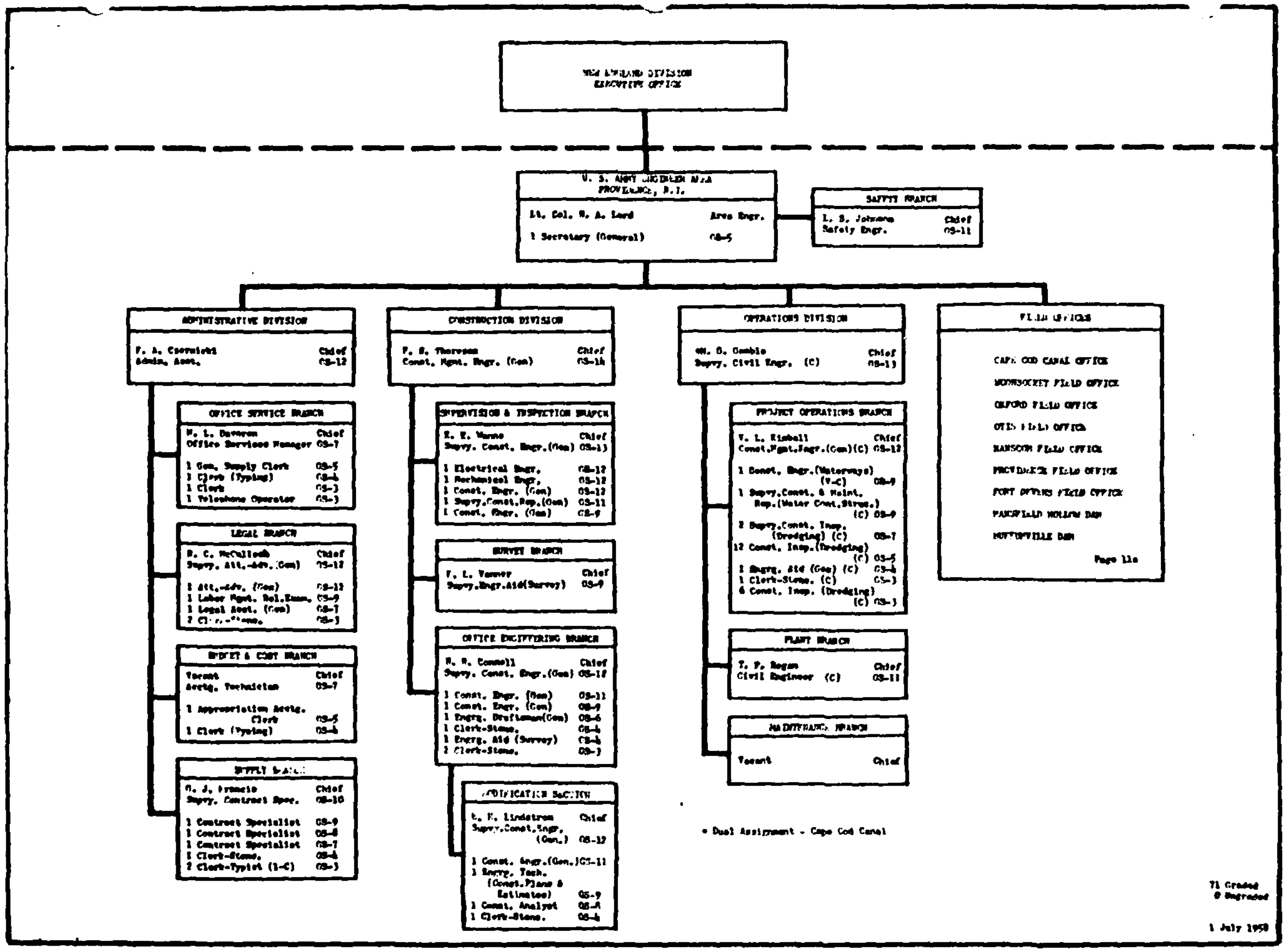
ENGINEERING DIVISION
SEE PAGE 8
HURRICANE STUDIES
PROJECT UNITS
MAPS & DISPLAYS SECTION
Chief
UTILITIES & RELOCATIONS SECT
Chief
HYDRAULICS & HYDROLOGY SECTION
E. F. Childs Chief
RIVERS & HARBORS & BEACH EROSION SECTION
Chief
ECONOMICS SECTION
Chief
N. E. FLOOD STUDIES

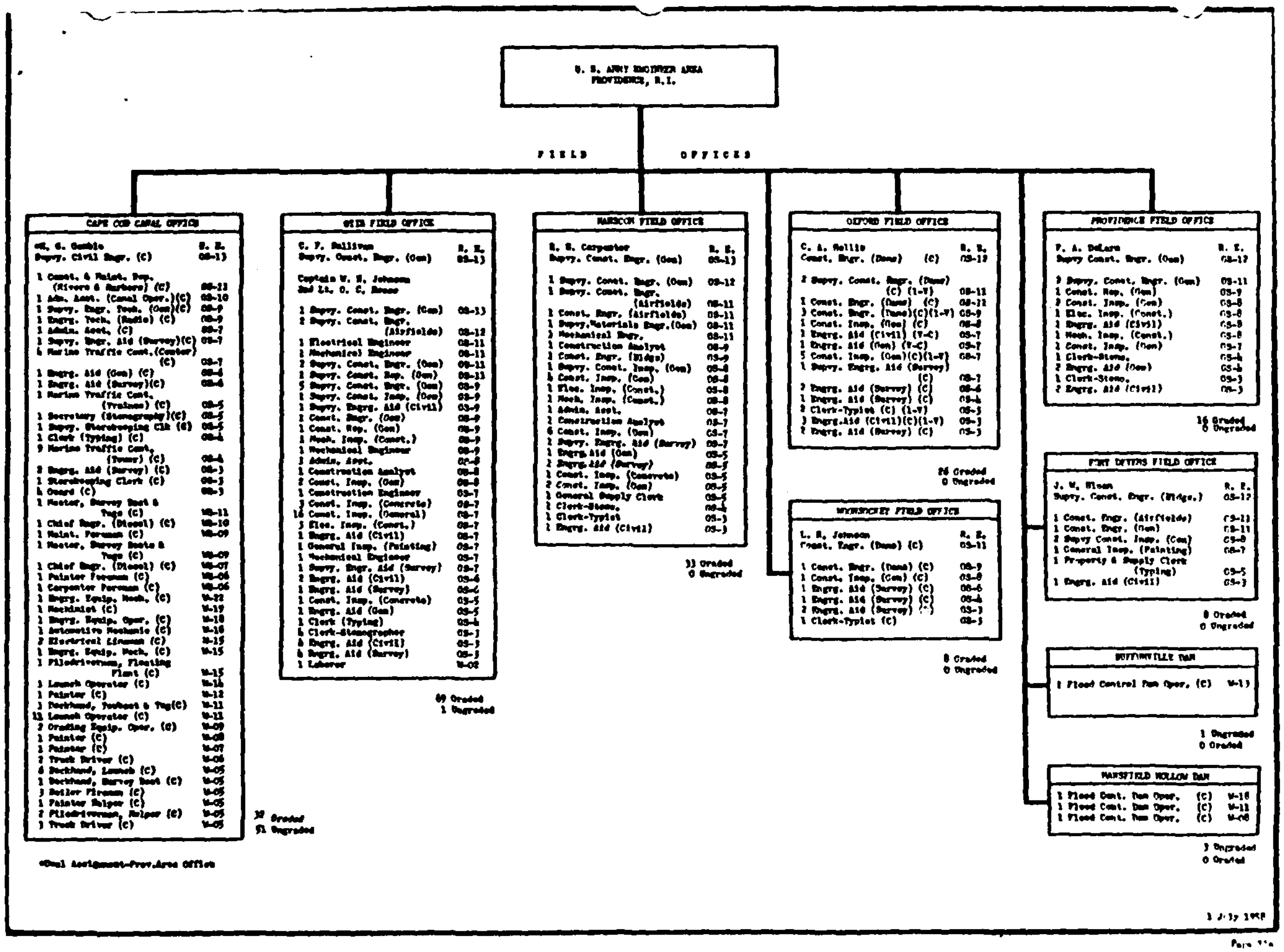

NEW ENGLAND DIVISION
EXECUTIVE OFFICE
ENGINEERING DIVISION
SEE PAGE 8
DESIGN BRANCH
MILITARY BRANCH
SEE PAGE 8
ELECTRICAL SECTION
MECHANICAL SECTION
STRUCTURAL SECTION
UTILITIES SECTION
SPECIFICATIONS SECTION
A-E CONTRACTS SECTION
AIR FORCE PROJECTS SECTION
SPECIAL MISSILE PROGRAMS BRC
FOUNDATION & MATERIALS SECT.
ARCTIC STUDIES
ALASKA FIELD GROUP
535 Graded
37 Ungraded
1 Other

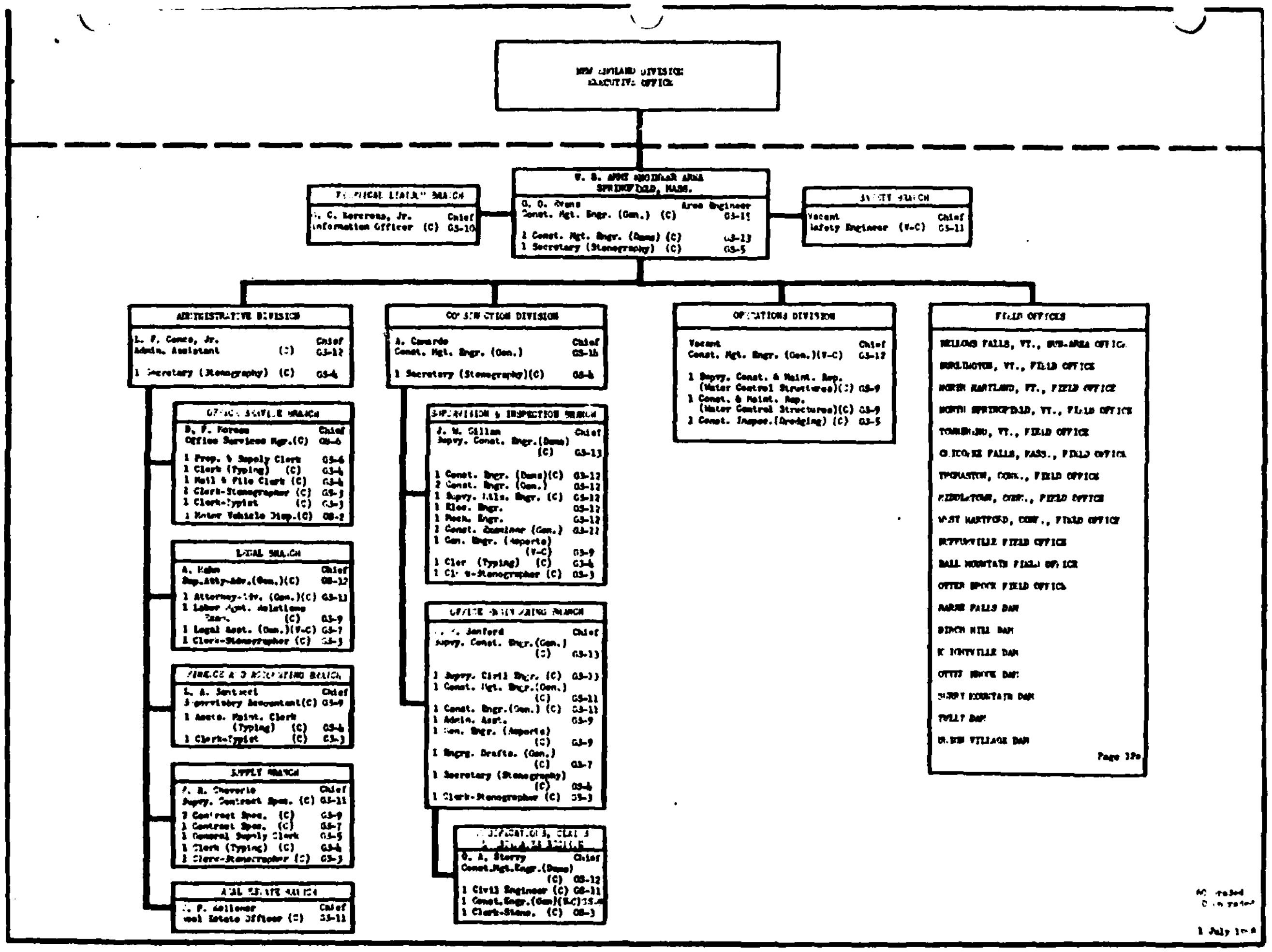

ENGLAND DIVISION
CONTROL SECTION
Chief
Civil Engineer
Clerk-Stenographer
Chief
Chief
Chief
Chief
Chief
FIELD
OFFICE

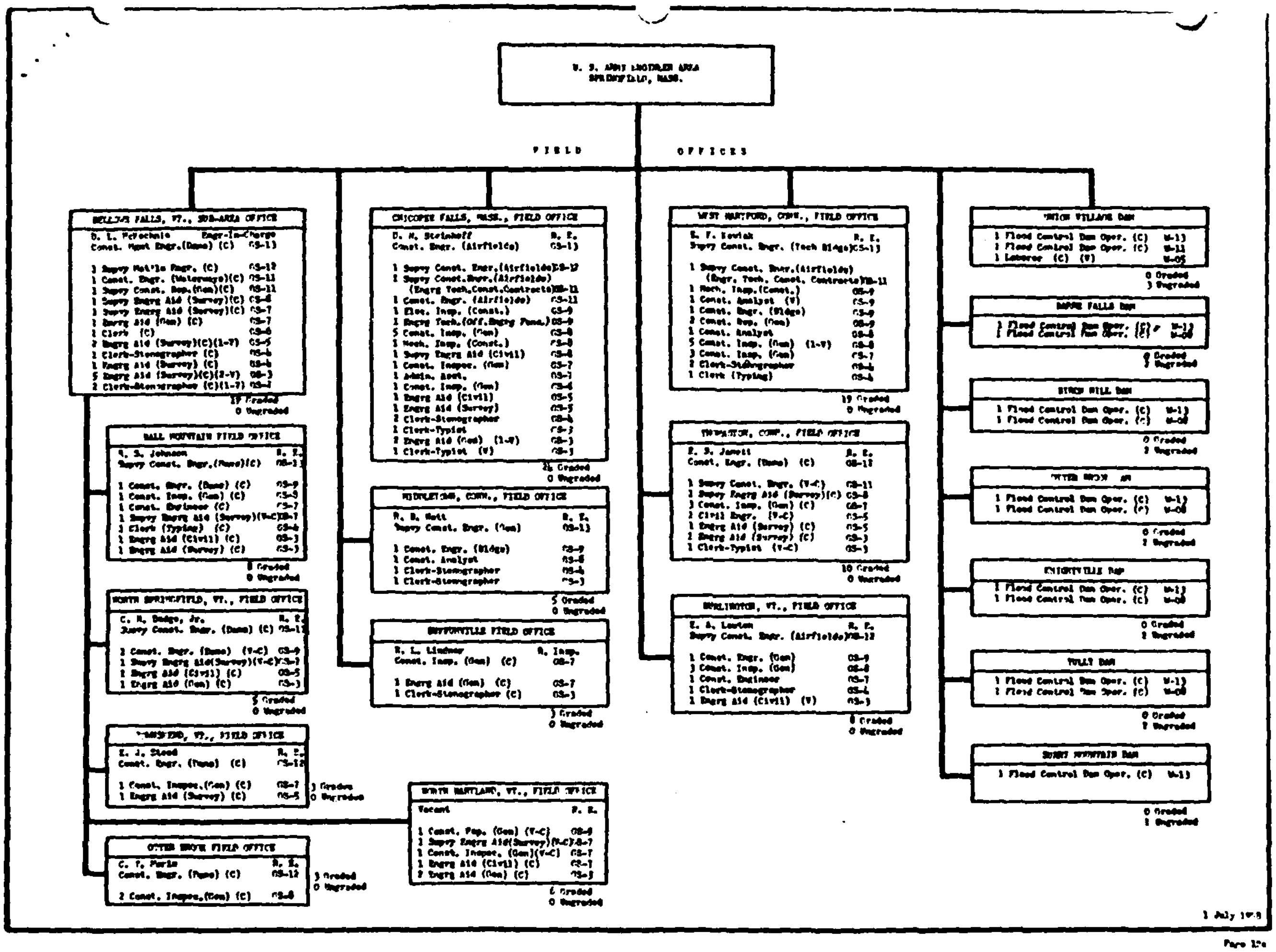

NEW ENGLAND DIVISION
EXECUTIVE OFFICE
U. S. ARMY ENGINEER AREA
PORTLAND, MAINE
Lt. Col. P. D. Carlson Area Engineer
1 Secretary (Steno.) GS-5
SAFETY BRANCH
Vacant Chief
ADMINISTRATIVE DIVISION
Chief
Admin. Assistant GS-11
OFFICE SERVICE BRANCH
Office Services Manager GS-9
1 Prop. Admin. GS-8
1 Clerk GS-5
1 Clerk-Steno. GS-4
1 Clerk GS-3
1 Clerk-Typist GS-2
BUDGET & COST BRANCH
A. C. Taylor Chief
Supvy. Fiscal Acct GS-9
1 Appro.Acctg.Clerk GS-5
1 Clerk (Typing) GS-4
1 Clerk-Steno. (V) GS-3
LEGAL BRANCH
F. E. Abraham Chief
Supvg. Atty-Adv. (Gen) GS-12
1 Atty-Adv. (Gen.) GS-11
1 Labor Mgt.Rel.Exam. GS-9
1 Legal Asst. (Gen.) GS-7
1 Clerk-Stenographer GS-3
SUPPLY BRANCH
Chief
Supvy. Contract Specialist GS-11
2 Contract Specialist GS-9
1 Contract Specialist GS-7
1 Clerk-Steno. GS-3
1 Clerk-Typist GS-3
REAL ESTATE BRANCH
Vacant Chief
CONSTRUCTION DIVISION
Chief
Const. Mgt. Engr. (Gen) GS-14
SUPERVISION & INSPECTION BRANCH
J. D. Thomas Chief
Supvy. Const. Engr. (Gen) GS-13
1 Elec. Engr. GS-12
1 Mech. Engr. GS-12
2 Civil Engr. GS-11
1 Const. Engr.(Bldgs) GS-11
1 Materials Engr. (Concrete) GS-11
1 Elec. Insp. (Const.) GS-9
1 Mech. Insp. (Const.) GS-9
1 Clerk-Steno. GS-4
OFFICE ENGINEERING BRANCH
Chief
Supvy. Const.Engr.(Gen) GS-13
1 Const.Engr.(Gen) (C) GS-9
1 Engrg. Aid (Civil) (V) GS-8
1 Clerk-Steno. GS-4
MODIFICATION SECTION
E. W. Smith Chief
Supvy Const.Engr. (Gen) GS-12
1 Clerk-Steno. GS-4
SURVEY SECTION
Chief
Supvy.Engrg.Aid (Survey) GS-9
OPERATIONS DIVISION
Vacant Chief
PROJECT OPERATIONS BRANCH
Chief
Const. Engineer(Bldgs) GS-11
MAINTENANCE BRANCH
Chief
Const. Engineer(Bldgs) GS-11
FIELD OFFICES
LIMESTONE, ME., FIELD OFFICE
BANGOR, ME., FIELD OFFICE
BANGOR, ME., FIELD OFFICE (BOMARC)
TOPSHAM, ME., FIELD OFFICE
PORTSMOUTH, N.H., FIELD OFFICE
MANCHESTER, N.H., FIELD OFFICE
BLACKWATER DAM
FRANKLIN FALLS DAM
EDWARD MacDOWELL DAM
Page 10a
* Dual Assignment
47 Graded
1 Ungraded
1 July 1958


U. S. ARMY ENGINEER AREA
PORTLAND, MAINE
FIELD OFFICES
LIMESTONE, MAINE, FIELD OFFICE
L. P. Theriault
Supvy Const. Engr. (Airfields)
Graded
Ungraded
PORTSMOUTH, N.H., FIELD OFFICE
C. D. Prince
Const. Engr. (Airfields)
0 Ungraded
BANGOR, MAINE, FIELD OFFICE
A. L. Heald
Supvy Const. Engr. (Airfields)
2 Ungraded
BANGOR, MAINE, FIELD OFFICE (POMARC)
A. L. Reed, Jr.
Const. Superintendent (Gen)
0 Ungraded
MANCHESTER, N.H., FIELD OFFICE
C. A. Bardwell
Supvy Const. Engr. (Airfields)
1 Const. Rep. (Gen)
0 Ungraded
TOPSHAM, MAINE, FIELD OFFICE
P. D. Jordan
Const. Rep. (Gen)
1 Graded
0 Ungraded
BLACKWATER DAM
1 Flood Cont. Dam Oper. (C)
0 Graded
1 Ungraded
FRANKLIN FALLS DAM
1 Const. & Maint. Rep. (Water Cont. Struc.) (C)
1 Flood Cont. Dam Oper. (C)
1 Flood Cont. Dam Oper. (C)
1 Graded
2 Ungraded
EDWARD MacDOWELL DAM
1 Flood Cont. Dam Oper. (C)
0 Graded
2 Ungraded


NEW ENGLAND DIVISION
EXECUTIVE OFFICE
U. S. ARMY ENGINEER AREA
PROVIDENCE, R.I.
Lt. Col. W. A. Lord Area Engr.
1 Secretary (General) GS-5
SAFETY BRANCH
L. S. Johnson Chief
Safety Engr. GS-11
ADMINISTRATIVE DIVISION
F. A. Cosentini Chief
Admin. Asst. GS-12
OFFICE SERVICE BRANCH
M. L. Duveran Chief
Office Services Manager GS-7
1 Gen. Supply Clerk GS-5
1 Clerk (Typing) GS-4
1 Clerk GS-3
1 Telephone Operator GS-3
LEGAL BRANCH
R. C. McCulloch Chief
Supvy. Att.-Adv. (Gen) GS-12
1 Att.-Adv. (Gen) GS-11
1 Labor Mgmt. Rel.Exam. GS-9
1 Legal Asst. (Gen) GS-7
2 GS-3
BUDGET & COST BRANCH
Vacant Chief
Acctg. Technician GS-7
1 Appropriation Acctg. Clerk GS-5
1 Clerk (Typing) GS-4
SUPPLY BRANCH
R. J. Francis Chief
Supvy. Contract Spec. GS-10
1 Contract Specialist GS-9
1 Contract Specialist GS-8
1 Contract Specialist GS-7
1 Clerk-Steno. GS-4
2 Clerk-Typist (1-C) GS-3
CONSTRUCTION DIVISION
F. R. Thoresen Chief
Const. Mgmt. Engr. (Gen) GS-14
SUPERVISION & INSPECTION BRANCH
E. E. Wanne Chief
Supvy. Const. Engr. (Gen) GS-13
1 Electrical Engr. GS-12
1 Mechanical Engr. GS-12
1 Const. Engr. (Gen) GS-12
1 Supvy.Const.Rep.(Gen) GS-11
1 Const. Engr. (Gen) GS-9
SURVEY BRANCH
F. L. Vanner Chief
Supvy.Engr.Aid(Survey) GS-9
OFFICE ENGINEERING BRANCH
R. R. Connell Chief
Supvy. Const. Engr. (Gen) GS-12
1 Const. Engr. (Gen) GS-11
1 Const. Engr. (Gen) GS-9
1 Engrg. Draftsman(Gen) GS-6
1 Clerk-Steno. GS-4
1 Engrg. Aid (Survey) GS-4
2 Clerk-Steno. GS-3
MODIFICATION SECTION
L. E. Lindstrom Chief
Supvy.Const.Engr. (Gen.) GS-12
1 Const. Engr.(Gen.) GS-11
1 Engrg. Tech. (Const.Plans & Estimates) GS-9
1 Const. Analyst GS-8
1 Clerk-Steno. GS-4
OPERATIONS DIVISION
W. O. Gamble Chief
Supvy. Civil Engr. (C) GS-13
PROJECT OPERATIONS BRANCH
V. L. Kimball Chief
Const.Mgmt.Engr.(Gen)(C) GS-12
1 Const. Engr.(Waterways) (V-C) GS-9
1 Supvy.Const. & Maint. Rep.(Water Cont.Struc.) (C) GS-9
2 Supvy.Const. Insp. (Dredging) (C) GS-7
12 Const. Insp.(Dredging) (C) GS-5
1 Engrg. Aid (Gen) (C) GS-4
1 Clerk-Steno. (C) GS-3
6 Const. Insp. (Dredging) (C) GS-3
PLANT BRANCH
T. F. Regan Chief
Civil Engineer (C) GS-11
MAINTENANCE BRANCH
Vacant Chief
FIELD OFFICES
CAPE COD CANAL OFFICE
WOONSOCKET FIELD OFFICE
OXFORD FIELD OFFICE
OTIS FIELD OFFICE
HANSCOM FIELD OFFICE
PROVIDENCE FIELD OFFICE
FORT DEVENS FIELD OFFICE
FAIRFIELD HOLLOW DAM
HOPKINTON DAM
Page 11a
* Dual Assignment - Cape Cod Canal
71 Graded
0 Ungraded
1 July 1958


U. S. ARMY ENGINEER AREA
PROVIDENCE, R.I.
FIELD OFFICES
CAPE COD CANAL OFFICE
OTIS FIELD OFFICE
HANSCOM FIELD OFFICE
OXFORD FIELD OFFICE
PROVIDENCE FIELD OFFICE
WOONSOCKET FIELD OFFICE
FORT DEVENS FIELD OFFICE
BUFFUMVILLE DAM
1 Flood Control Dam Oper. (C) W-13
MANSFIELD HOLLOW DAM
33 Graded
0 Ungraded
26 Graded
0 Ungraded
16 Graded
0 Ungraded
8 Graded
0 Ungraded
1 Ungraded
0 Graded
3 Ungraded
0 Graded

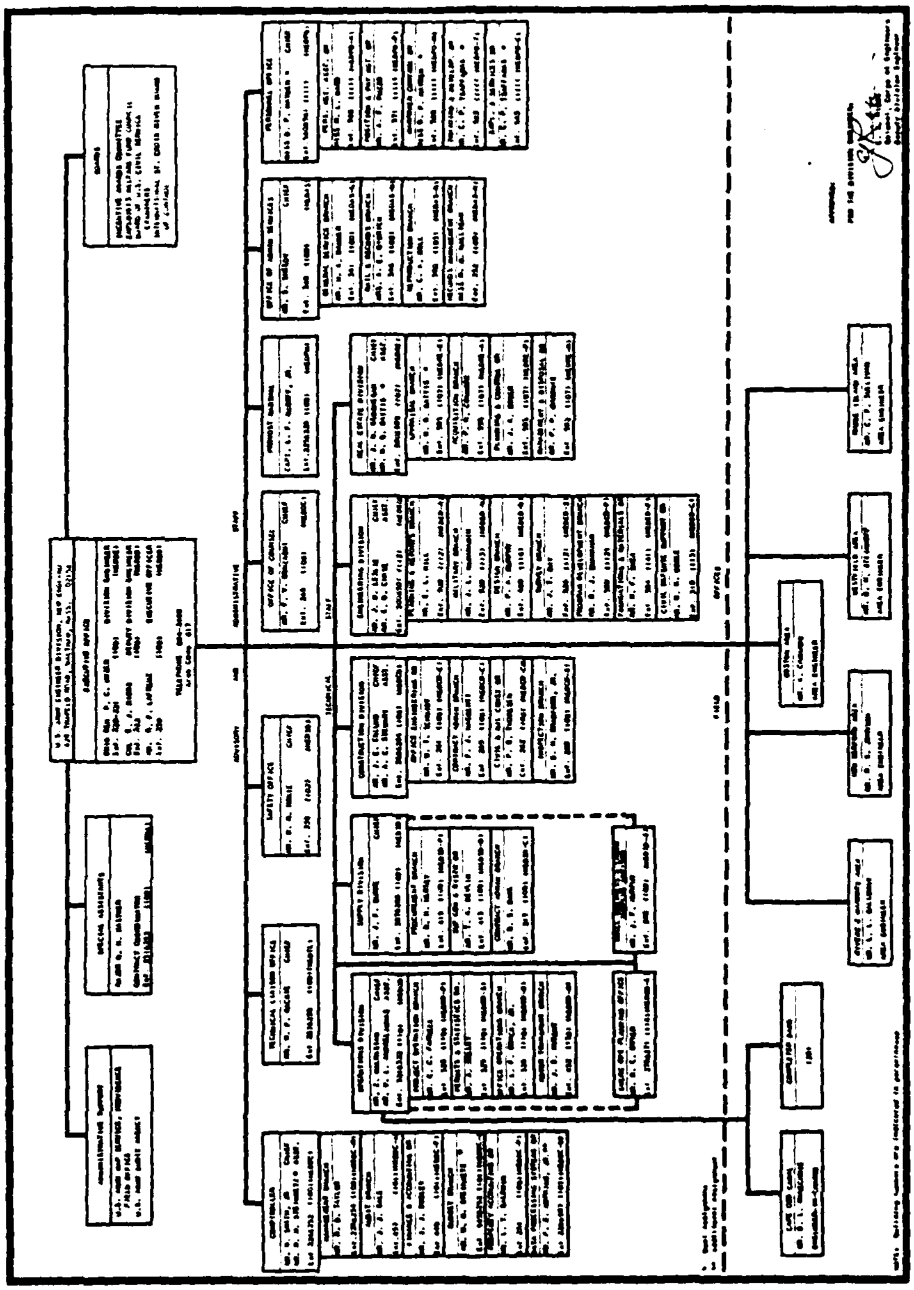

U. S. ARMY ENGINEER AREA
SPRINGFIELD, MASS.
G. O. Evans Area Engineer
Const. Mgt. Engr. (Gen.) (C) GS-15
1 Const. Mgt. Engr. (Dams) (C) GS-13
1 Secretary (Stenography) (C) GS-5
C. Kererona, Jr. Chief
Information Officer (C) GS-10
SAFETY BRANCH
Vacant Chief
Safety Engineer (V-C) GS-11
ADMINISTRATIVE DIVISION
L. F. Conte, Jr. Chief
Admin. Assistant (C) GS-12
1 Secretary (Stenography) (C) GS-4
OFFICE SERVICE BRANCH
D. F. Koreen Chief
Office Services Mgr. (C) GS-6
1 Prop. & Supply Clerk GS-6
1 Clerk (Typing) (C) GS-4
1 Mail & File Clerk (C) GS-4
1 Clerk-Stenographer (C) GS-3
1 Clerk-Typist (C) GS-3
1 Motor Vehicle Disp. (C) GS-2
LEGAL BRANCH
A. Kahn Chief
Sup. Atty-Adv. (Gen.) (C) GS-12
1 Attorney-Adv. (Gen.) (C) GS-11
1 Labor Mgt. Relations Exam. (C) GS-9
1 Legal Asst. (Gen.) (V-C) GS-7
1 Clerk-Stenographer (C) GS-3
Supervisory Accountant (C) GS-9
1 Accts. Maint. Clerk (Typing) (C) GS-4
1 Clerk-Typist (C) GS-3
SUPPLY BRANCH
Supvy. Contract Spec. (C) GS-11
1 Contract Spec. (C) GS-9
1 Contract Spec. (C) GS-7
1 General Supply Clerk GS-5
1 Clerk (Typing) (C) GS-4
1 Clerk-Stenographer (C) GS-3
Real Estate Officer (C) GS-11
CONSTRUCTION DIVISION
A. Camardo Chief
Const. Mgt. Engr. (Gen.) GS-14
1 Secretary (Stenography) (C) GS-4
SUPERVISION & INSPECTION BRANCH
J. M. Gillan Chief
Supvy. Const. Engr. (Dams) (C) GS-13
1 Const. Engr. (Dams) (C) GS-12
2 Const. Engr. (Gen.) GS-12
1 Elec. Engr. GS-12
1 Mech. Engr. GS-12
1 Gen. Engr. (Reports) (V-C) GS-9
1 Clerk (Typing) (C) GS-4
Sanford Chief
Supvy. Const. Engr. (Gen.) (C) GS-13
1 Supvy. Civil Engr. (C) GS-13
1 Const. Mgt. Engr. (Gen.) (C) GS-11
1 Const. Engr. (Gen.) (C) GS-11
1 Admin. Asst. GS-9
1 Gen. Engr. (Reports) (C) GS-9
1 Engrg. Drafts. (Gen.) (C) GS-7
1 Secretary (Stenography) (C) GS-4
1 Clerk-Stenographer (C) GS-3
Chief
Const. Mgt. Engr. (Dams) (C) GS-12
1 Civil Engineer (C) GS-11
1 Clerk-Steno. (C) GS-3
OPERATIONS DIVISION
Vacant Chief
Const. Mgt. Engr. (Gen.) (V-C) GS-12
1 Supvy. Const. & Maint. Rep. (Water Control Structures) (C) GS-9
1 Const. & Maint. Rep. (Water Control Structures) (C) GS-9
1 Const. Inspec. (Dredging) (C) GS-5
FIELD OFFICES
BELLOWS FALLS, VT., SUB-AREA OFFICE
BURLINGTON, VT., FIELD OFFICE
NORTH HARTLAND, VT., FIELD OFFICE
NORTH SPRINGFIELD, VT., FIELD OFFICE
TOWNSHEND, VT., FIELD OFFICE
CHICOPEE FALLS, MASS., FIELD OFFICE
THOMASTON, CONN., FIELD OFFICE
MIDDLETOWN, CONN., FIELD OFFICE
WEST HARTFORD, CONN., FIELD OFFICE
BALL MOUNTAIN FIELD OFFICE
OTTER BROOK FIELD OFFICE
BIRCH HILL DAM
TULLY DAM
Page 17a

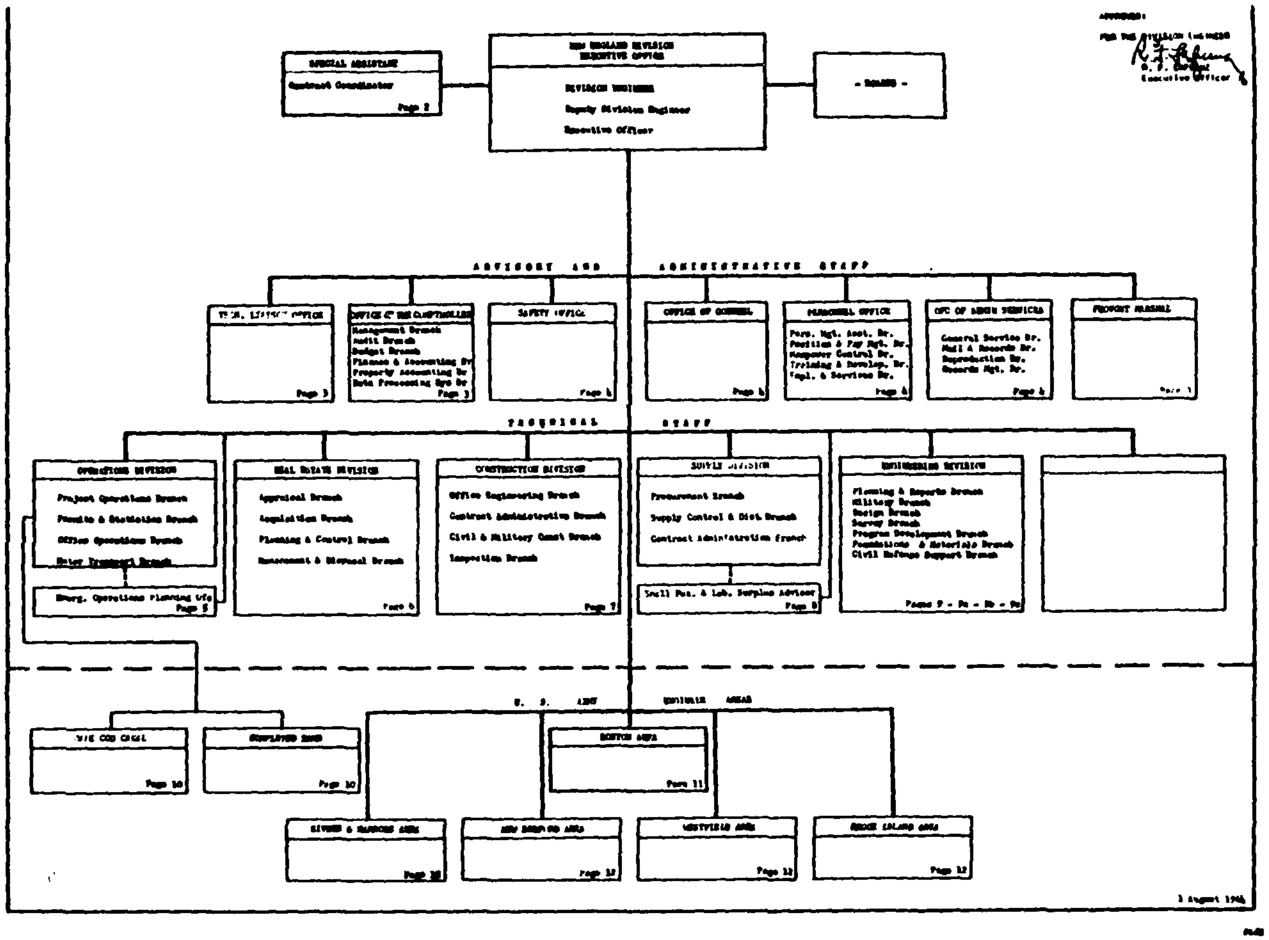

FIELD
OFFICES
BELLOWS FALLS, VT., SUB-AREA OFFICE
CHICOPEE FALLS, MASS., FIELD OFFICE
WEST HARTFORD, CONN., FIELD OFFICE
BALL MOUNTAIN FIELD OFFICE
MIDDLETOWN, CONN., FIELD OFFICE
BURLINGTON, VT., FIELD OFFICE
OTTER BROOK FIELD OFFICE
TULLY DAM
1 July 19..

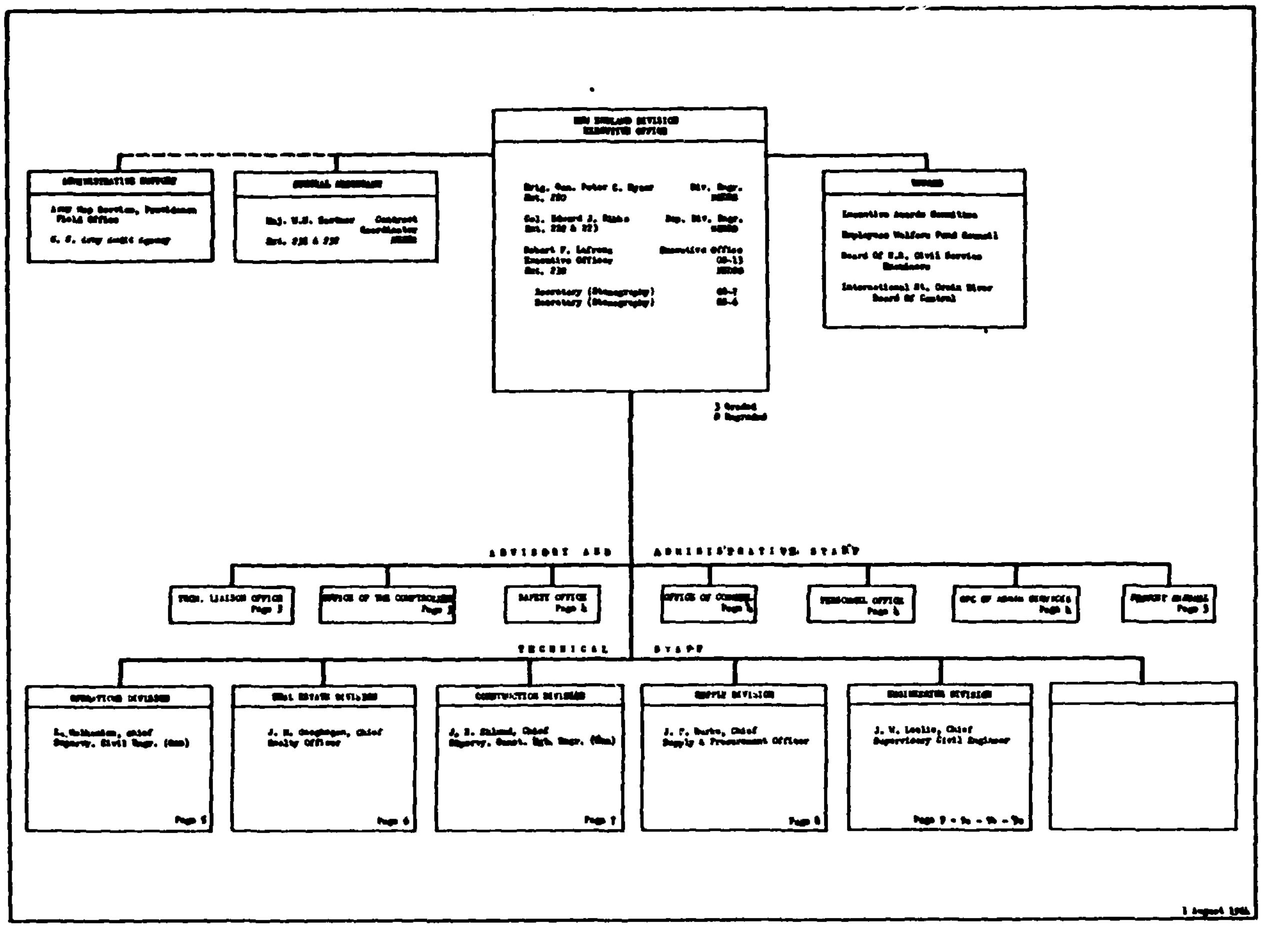
APPENDIX C

Organization Chart

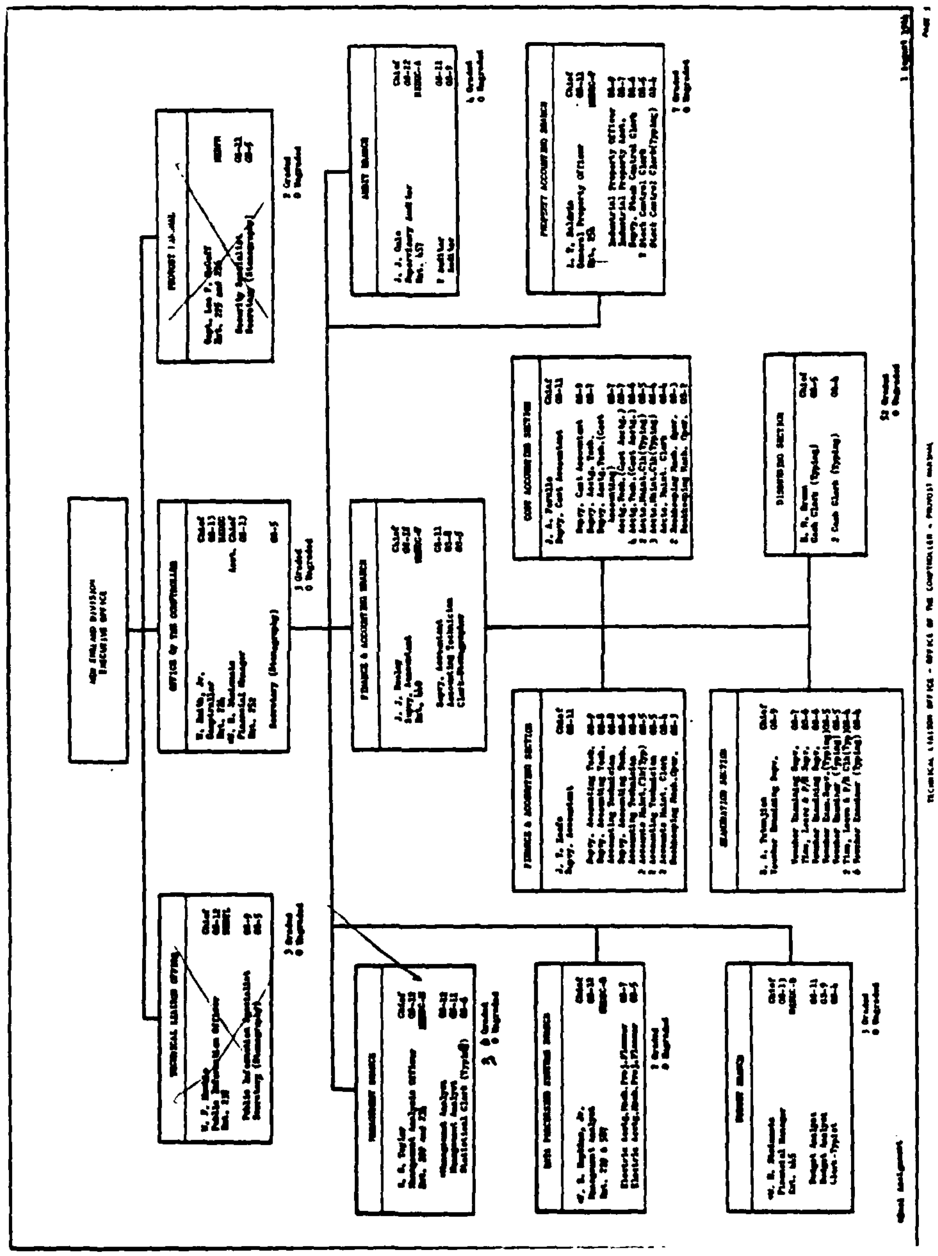
1 August 1964

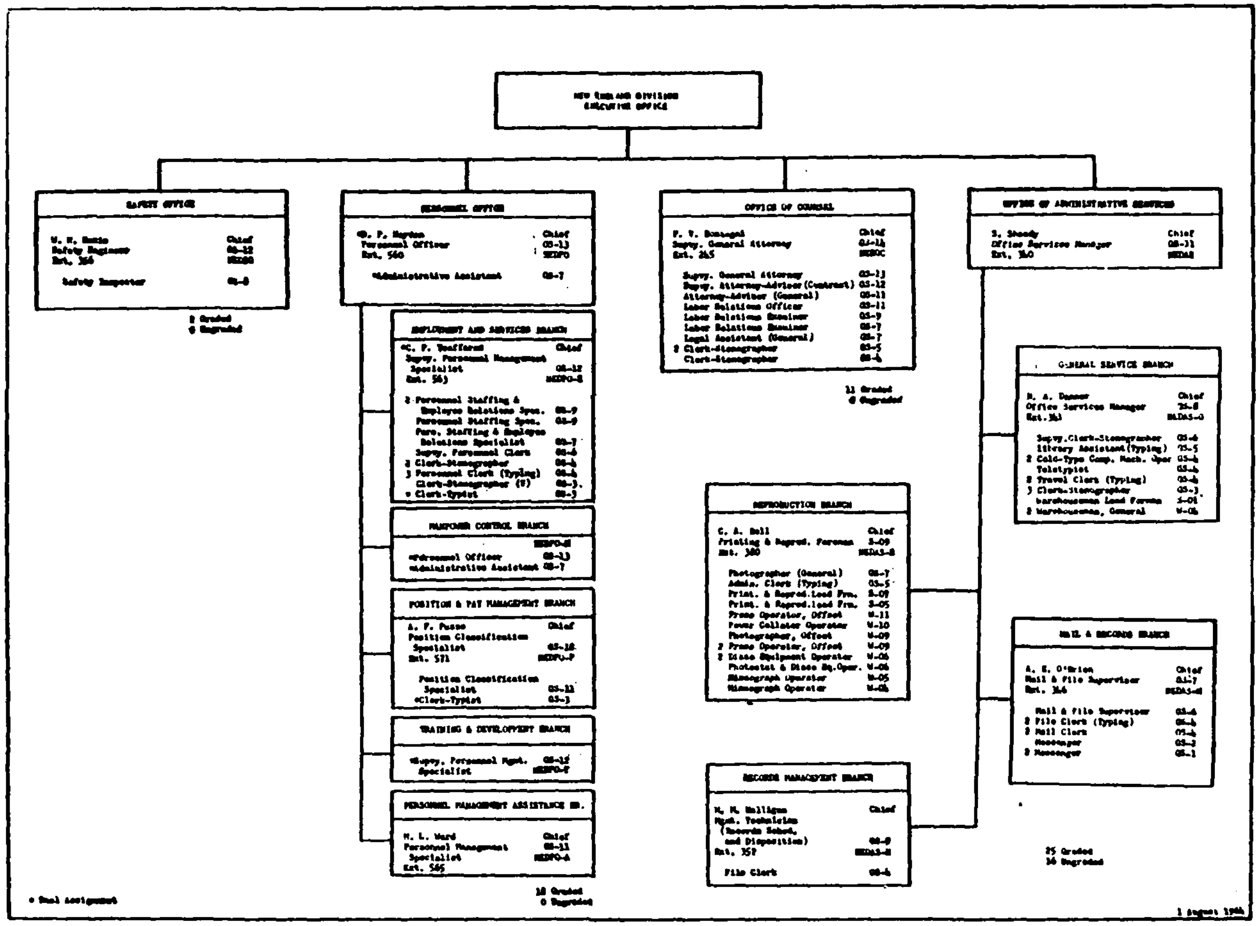



Special Assistant
Page 2
Division Engineer
Deputy Division Engineer
Executive Officer
- BOARDS -
Executive Officer
ADVISORY AND ADMINISTRATIVE STAFF
Page 3
Management Branch
Audit Branch
Budget Branch
Finance & Accounting Br
Property Accounting Br
Data Processing Sys Br
Page 3
SAFETY OFFICE
Page 4
OFFICE OF COUNSEL
Page 4
PERSONNEL OFFICE
Page 4
OFC OF ADMIN SERVICES
General Service Br.
Mail & Records Br.
Reproduction Br.
Records Mgt. Br.
Page 4
PROVOST MARSHAL
TECHNICAL STAFF
OPERATIONS DIVISION
Project Operations Branch
Permits & Statistics Branch
Office Operations Branch
Motor Transport Branch
Emerg. Operations Planning Ofc
Page 5
REAL ESTATE DIVISION
Appraisal Branch
Acquisition Branch
Planning & Control Branch
Management & Disposal Branch
Page 6
CONSTRUCTION DIVISION
Office Engineering Branch
Contract Administration Branch
Civil & Military Const Branch
Inspection Branch
Page 7
SUPPLY DIVISION
Procurement Branch
Supply Control & Dist Branch
Contract Administration Branch
Small Bus. & Lab. Surplus Advisor
Page 8
ENGINEERING DIVISION
Planning & Reports Branch
Military Branch
Design Branch
Survey Branch
Program Development Branch
Foundations & Materials Branch
Civil Defense Support Branch
Pages 9 - 9a - 9b - 9c
U. S. ARMY ENGINEER AREAS
CAPE COD CANAL
Page 10
Page 10
BOSTON AREA
Page 11
Page 12
Page 12
WESTFIELD AREA
Page 12
RHODE ISLAND AREA
Page 12
1 August 1966

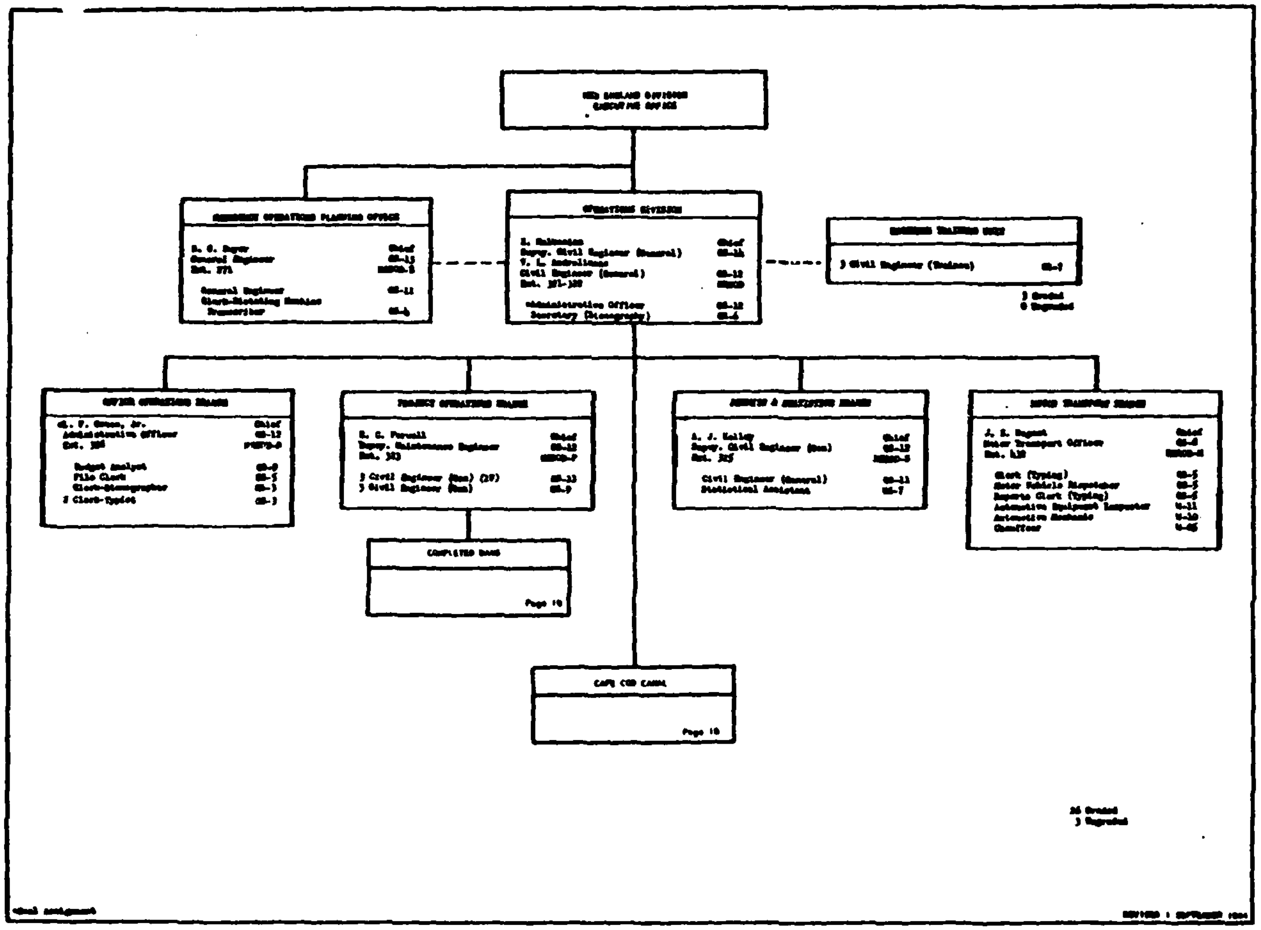


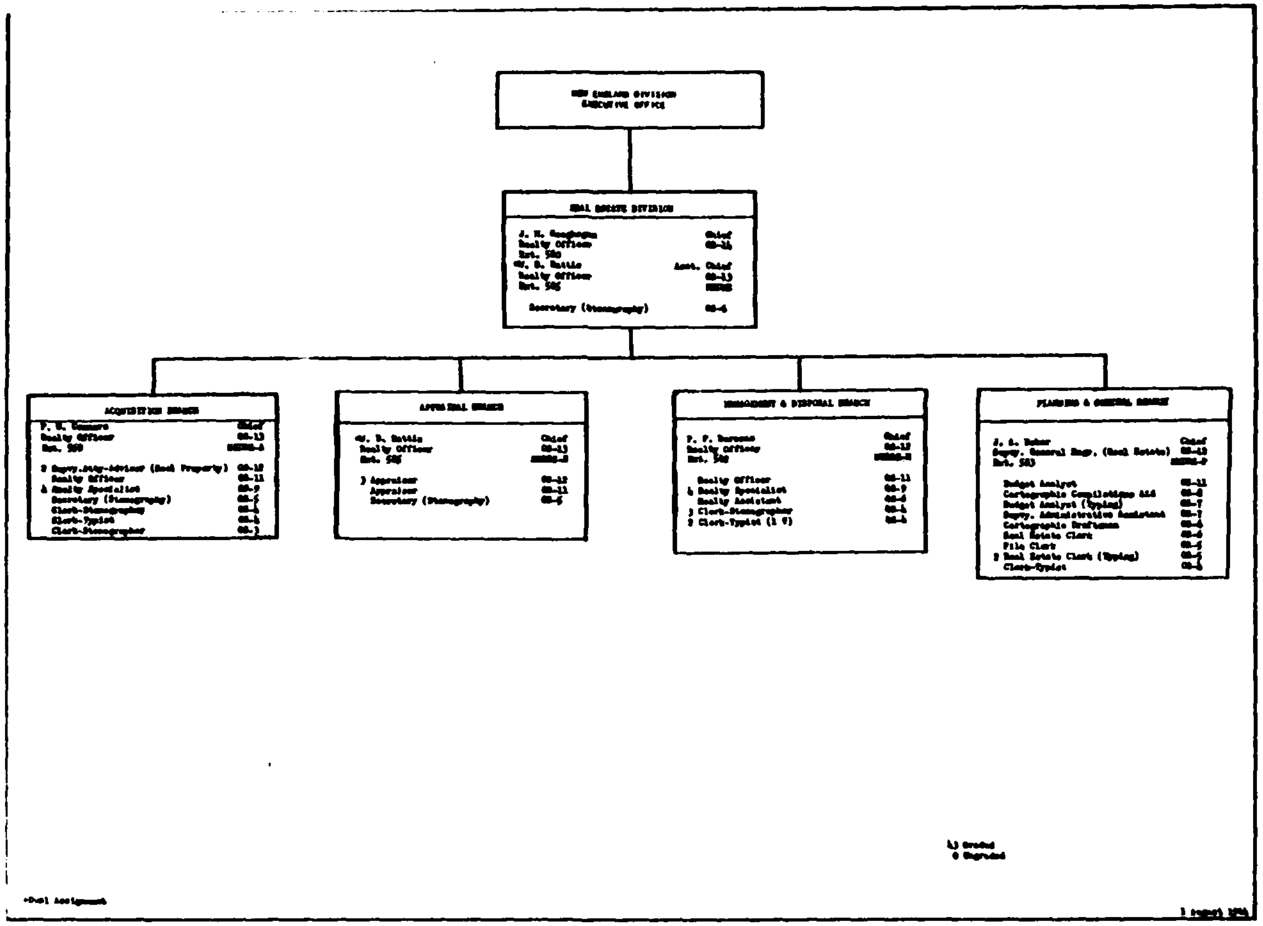
EXECUTIVE OFFICE - BOARDS - DIVISION HEADS



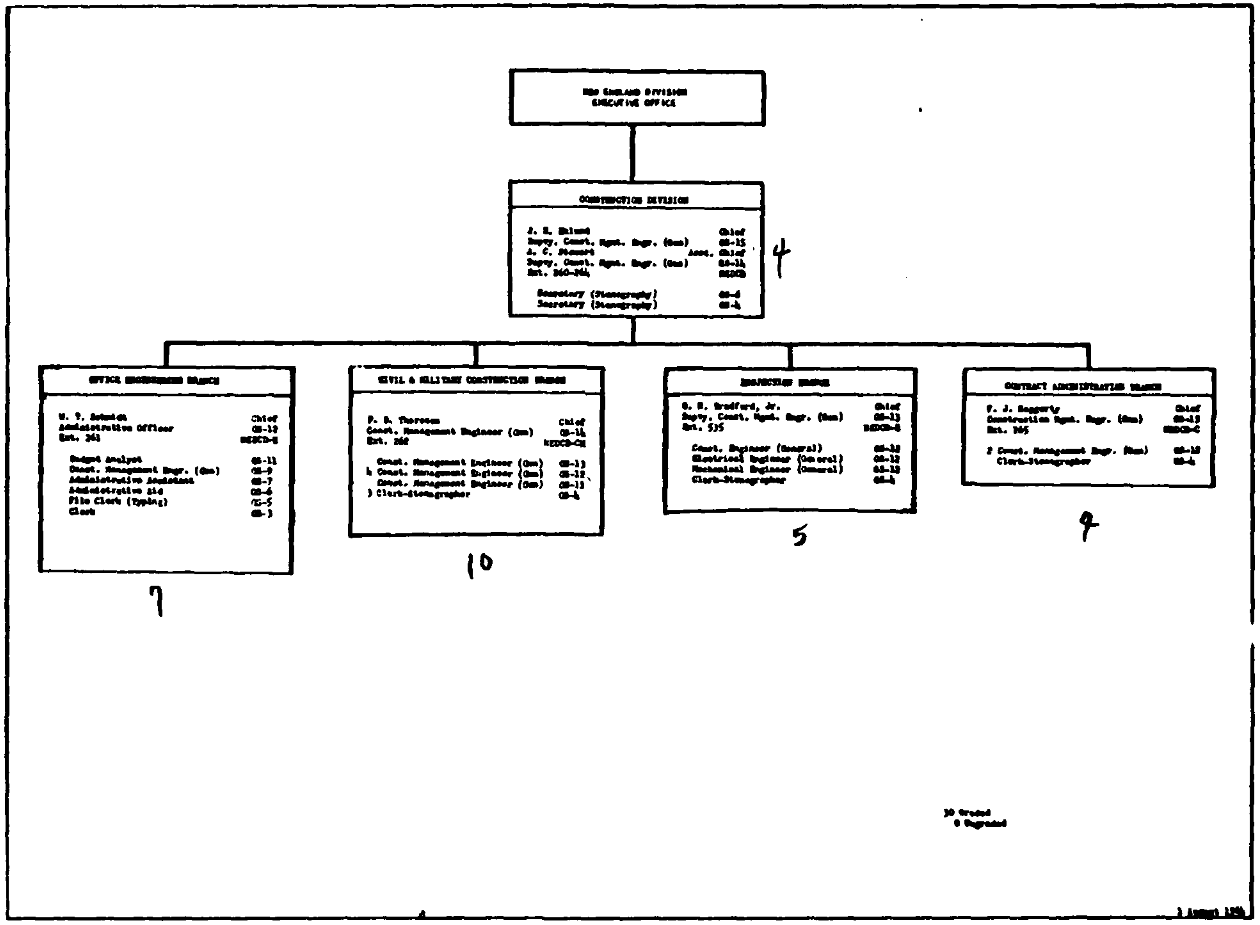


SAFETY OFFICE - PERSONNEL OFFICE - OFFICE OF COUNSEL - OFFICE OF ADMINISTRATIVE SERVICES

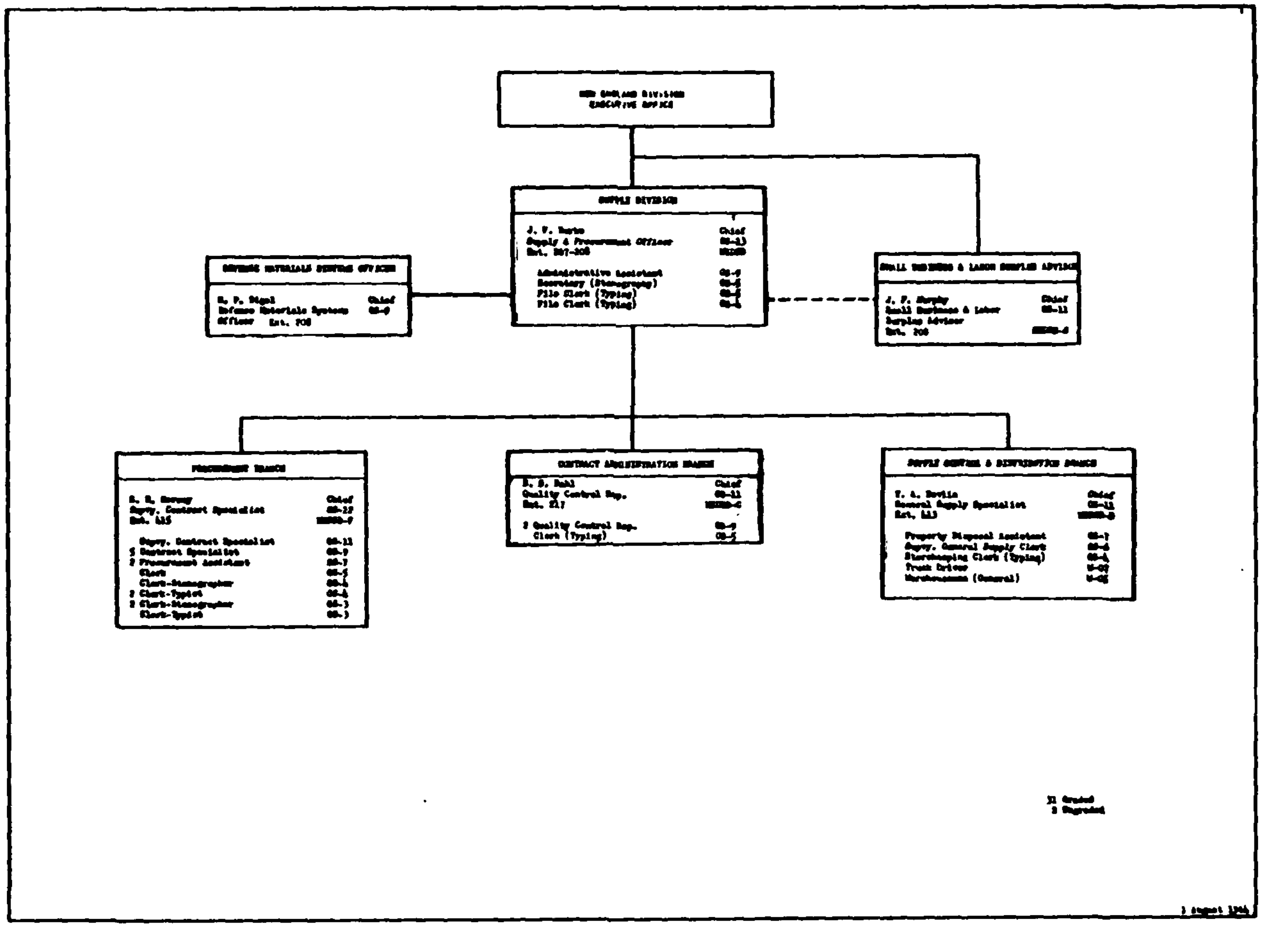

OPERATIONS DIVISION
Budget Analyst
File Clerk
Clerk (Typing)
Chauffeur
COMPLETED DAMS
Page 10
CAPE COD CANAL
Page 10



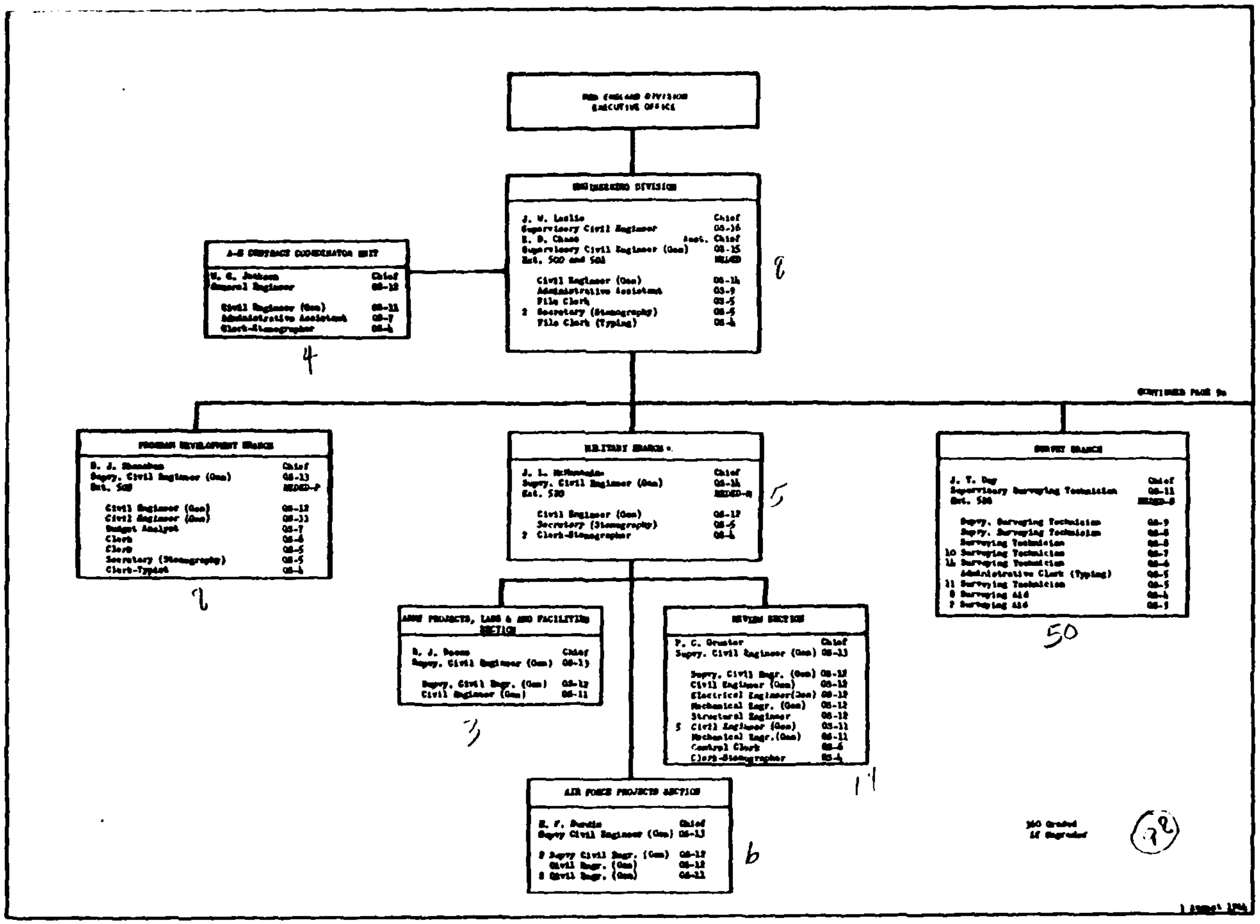
NEW ENGLAND DIVISION
EXECUTIVE OFFICE
REAL ESTATE DIVISION
Realty Officer
Secretary (Stenography)
ACQUISITION BRANCH
Realty Officer
Realty Specialist
Secretary (Stenography)
Clerk-Typist
APPRAISAL BRANCH
Realty Officer
Appraiser
Appraiser
Secretary (Stenography)
MANAGEMENT & DISPOSAL BRANCH
Realty Officer
Realty Officer
Realty Specialist
Realty Assistant
Clerk-Stenographer
Clerk-Typist
Budget Analyst
Budget Analyst (Typing)
Real Estate Clerk
File Clerk
Real Estate Clerk (Typing)
Clerk-Typist



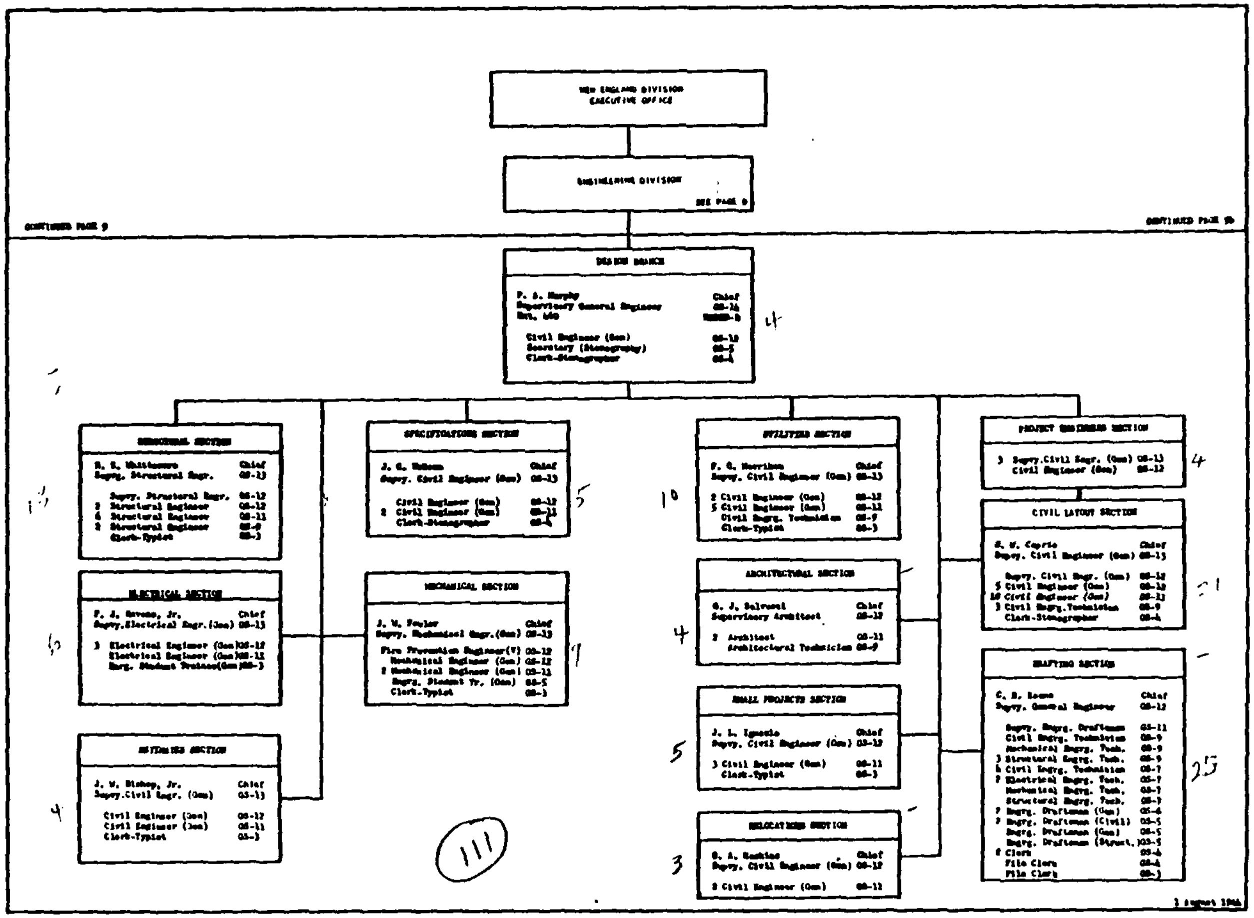
CONSTRUCTION DIVISION



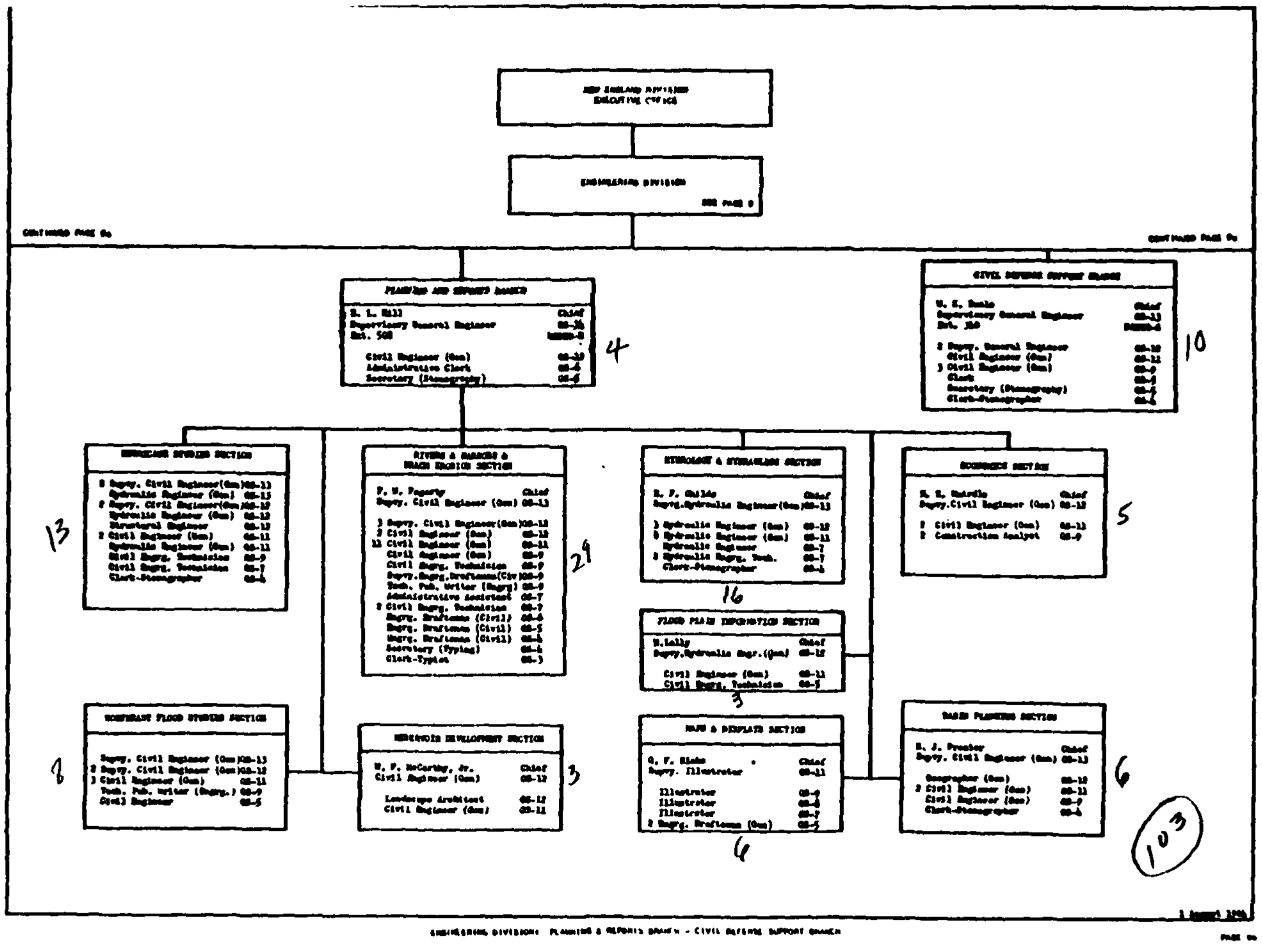
SUPPLY DIVISION

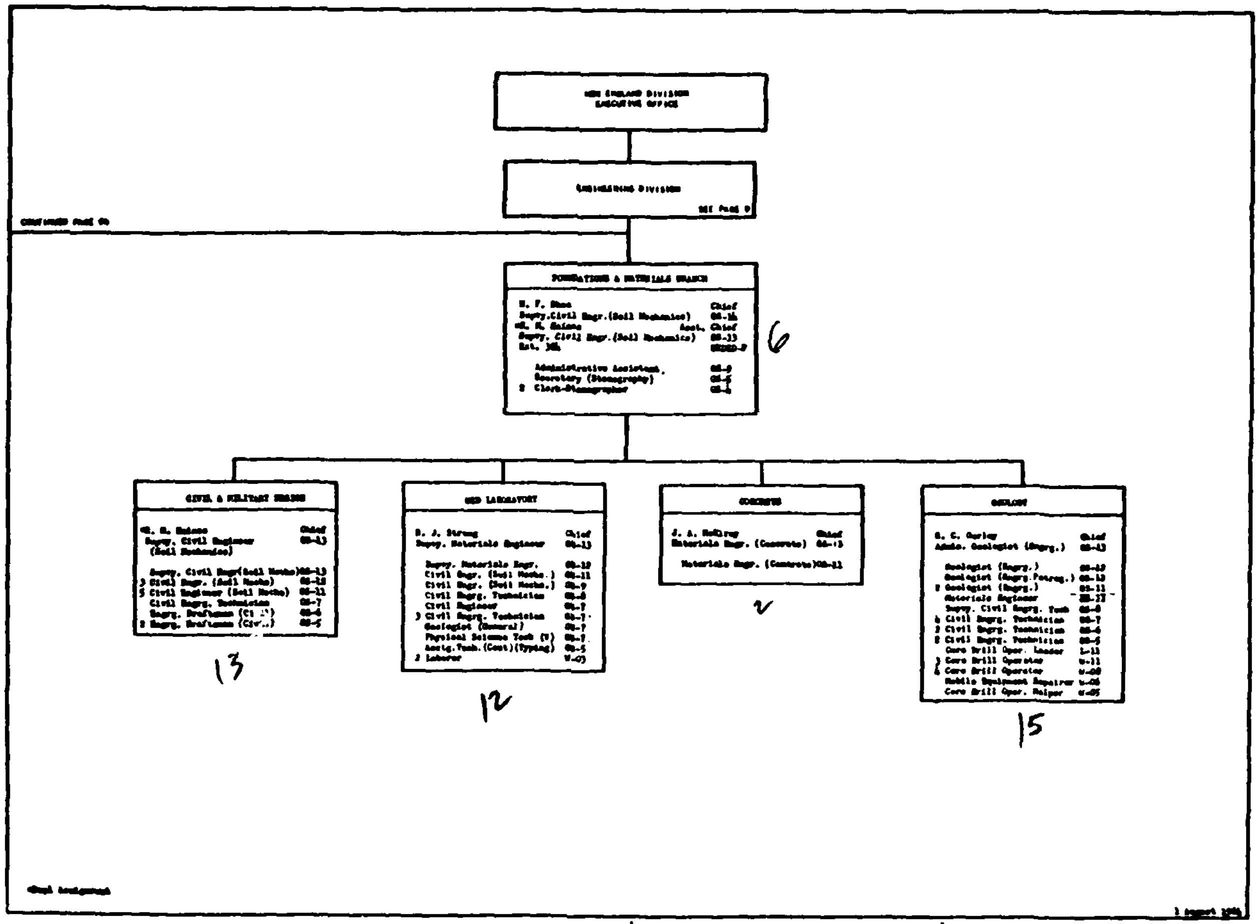


ENGINEERING DIVISION: PROGRAM DEVELOPMENT BRANCH - MILITARY BRANCH - SURVEY BRANCH

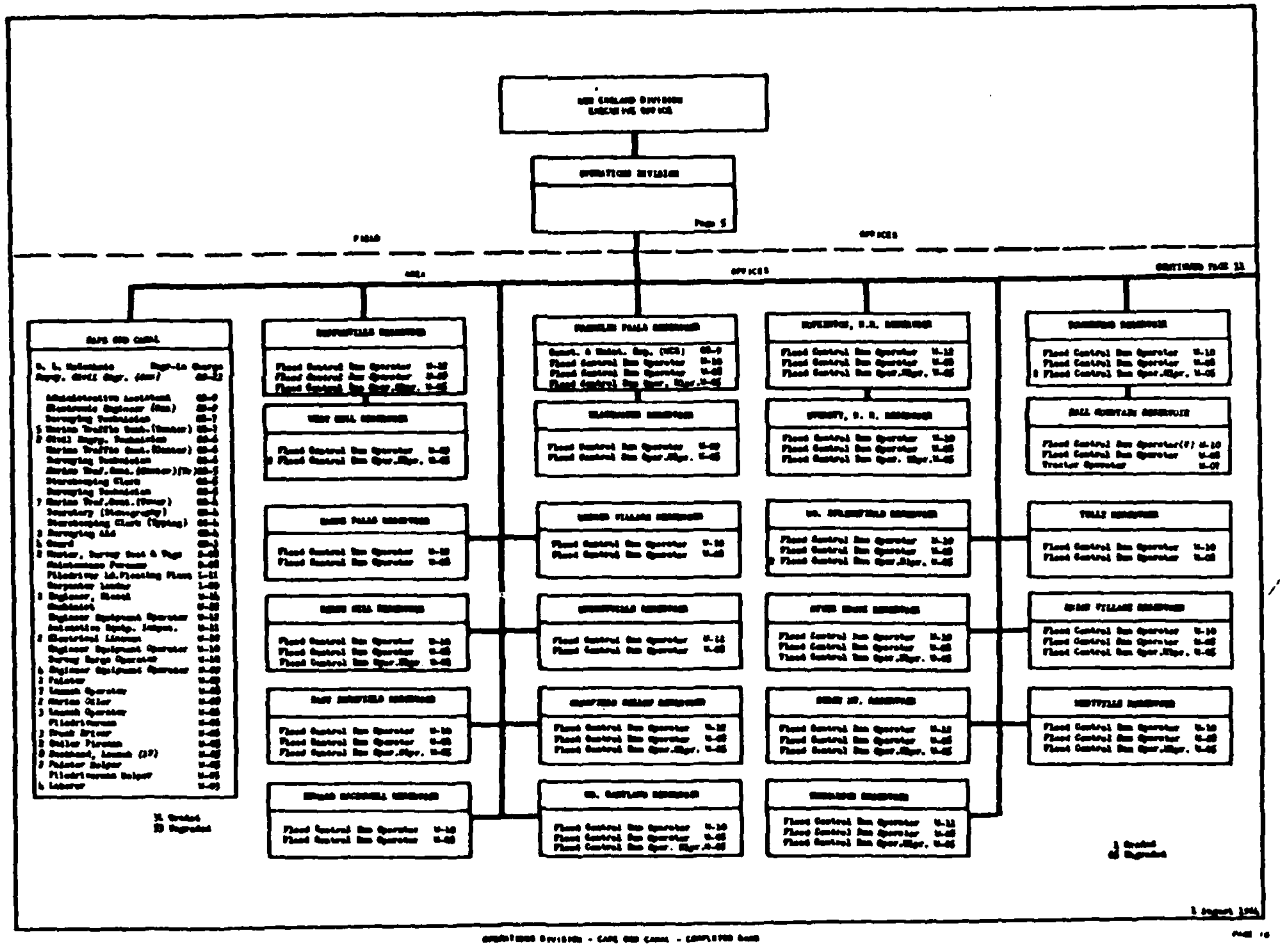


ENGINEERING DIVISION: DESIGN BRANCH


NEW ENGLAND DIVISION
EXECUTIVE OFFICE
ENGINEERING DIVISION
SEE PAGE 9
CONTINUED PAGE 9a
CONTINUED PAGE 9c
PLANNING AND REPORTS BRANCH
E. L. Hill
Supervisory General Engineer
4
CIVIL DEFENSE SUPPORT BRANCH
10
HURRICANE STUDIES SECTION
13
RIVERS & HARBORS & BEACH EROSION SECTION
29
HYDROLOGY & HYDRAULICS SECTION
16
ECONOMICS SECTION
5
FLOOD PLAIN INFORMATION SECTION
3
NORTHEAST FLOOD STUDIES SECTION
8
RESERVOIR DEVELOPMENT SECTION
3
MAPS & DISPLAYS SECTION
4
BASIN PLANNING SECTION
6
103
ENGINEERING DIVISION: PLANNING & REPORTS BRANCH - CIVIL DEFENSE SUPPORT BRANCH
PAGE 9b



ENGINEERING DIVISION FOUNDATIONS & MATERIALS BRANCH



NEW ENGLAND DIVISION
EXECUTIVE OFFICE

FIELD OFFICES

CONTINUED PAGE 10 AREA OFFICES CONTINUED PAGE 12

U. S. ARMY ENGINEER AREA
BOSTON, MASSACHUSETTS

BOSTON AREA OFFICE

A. Camardo — Area Engineer
Supvy. Const. Engineer (Gen) GS-14
NEDAB-BO

Supvy. Const. Engineer (Gen) GS-13
Const. Mgmt. Engineer (Gen) GS-12
Const. Representative (Gen) GS-11
Const. Engineering Technician GS-9
Const. Inspector (Gen) GS-9
Administrative Assistant GS-7
Const. Inspector (Gen) GS-7
Surveying Technician GS-7
Clerk-Stenographer (F) GS-4
Clerk-Typist GS-4

11

BOSTON (VA HOSPITAL) FIELD OFFICE

6

Supvy. Const. Engineer (Tech. Bldgs.) GS-12
Const. Mgmt. Engineer (Bldgs.) GS-11
3 Const. Representative (Gen) GS-9
Const. Inspector (Gen) GS-8

NATICK, MASS. FIELD OFFICE

1

Supvy. Const. Engineer (Tech. Bldgs) GS-12

BROCKTON, MASS. FIELD OFFICE

Const. Representative (Bldgs.&Utils.) GS-9

FORT DEVENS FIELD OFFICE

Supvy. Const. Engineer (Tech.Bldgs.) GS-12
Const. Engineer (Gen) GS-11
Const. Representative (Bldgs.&Util.) GS-11
Const. Inspector (Bldgs. & Util.) GS-8

HOPKINTON-EVERETT Nike FIELD OFFICE

Civil Engineering Technician GS-8

6

BANGOR, MAINE, FIELD OFFICE

Const. Engineer (Gen) GS-11

HANSCOM FIELD OFFICE

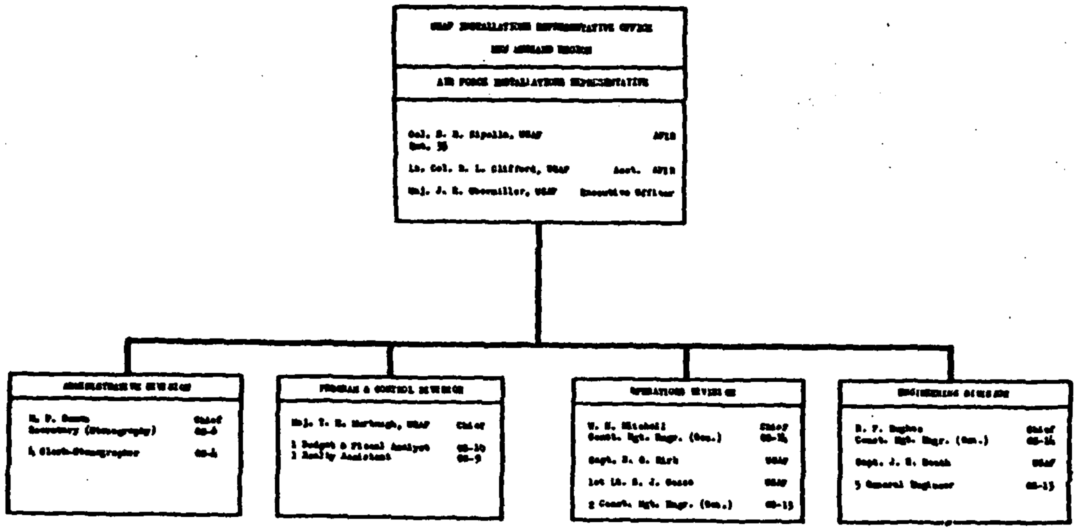
Supvy. Const. Engineer (Airfields) GS-12
Supvy. Const. Representative (Gen) GS-11
Civil Engineering Technician GS-6

4

29 Graded
0 Ungraded

1 August 1966

AREA OFFICES: BOSTON



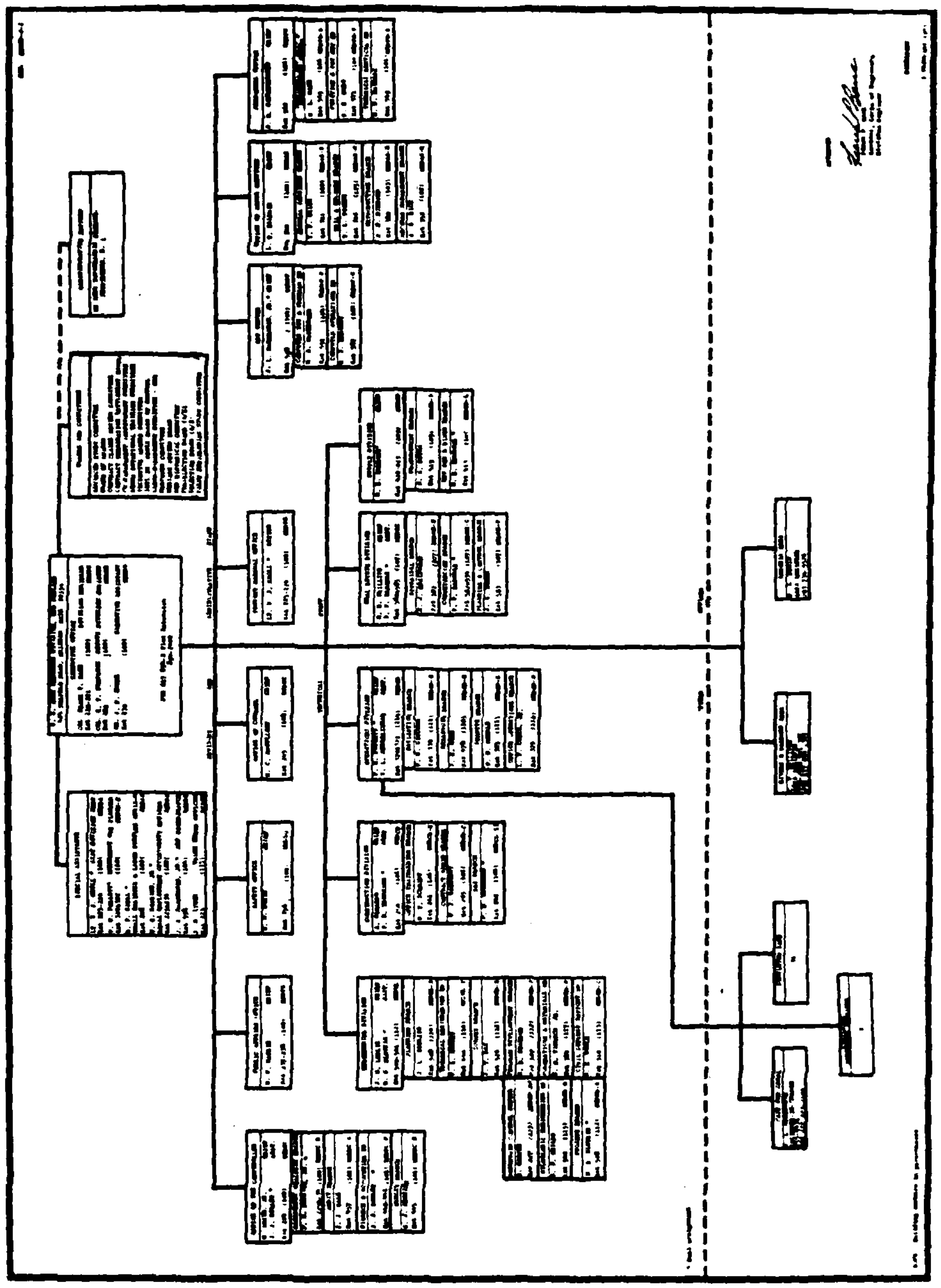
16 Graded
0 Ungraded

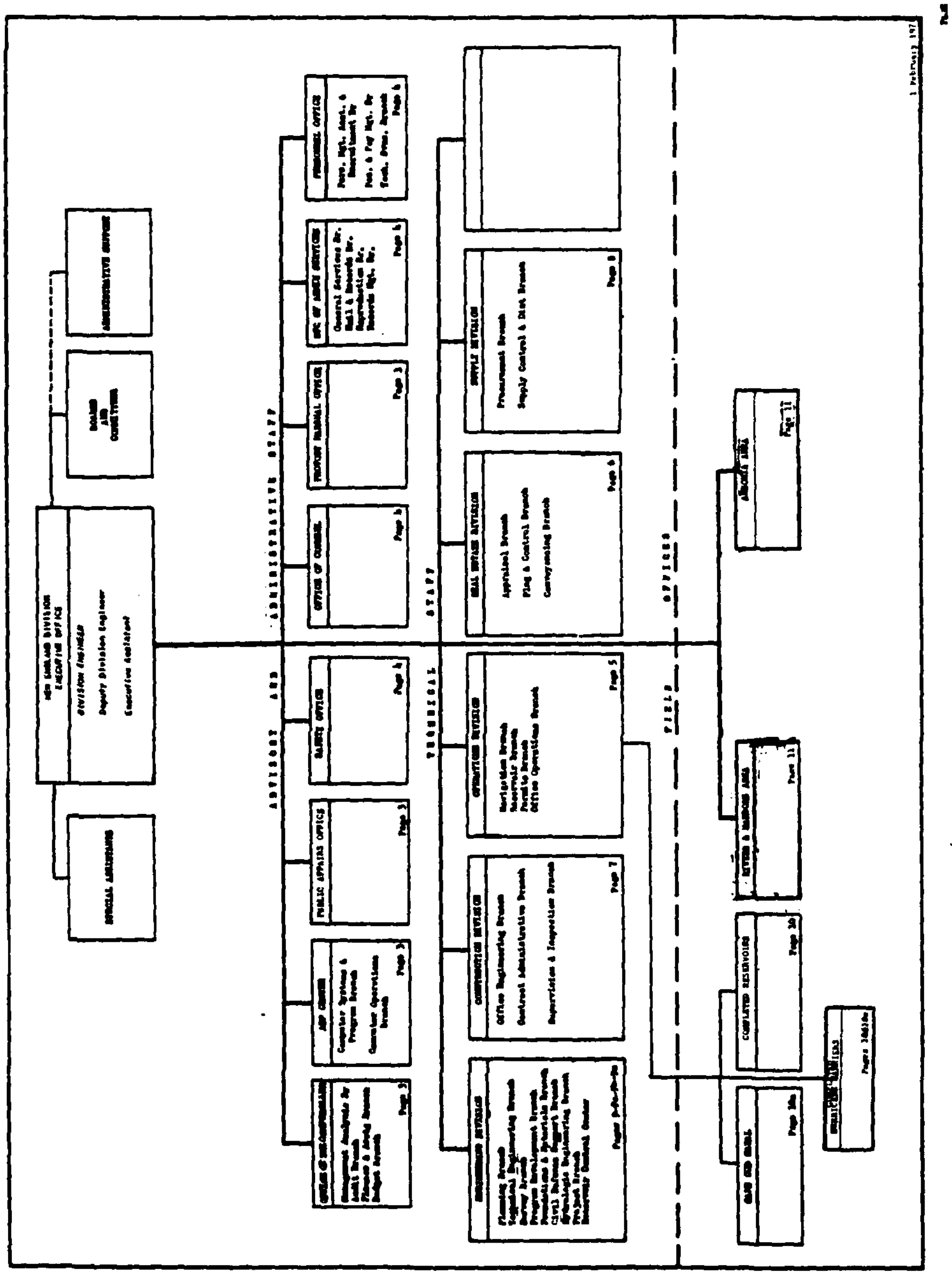
1 July 1959

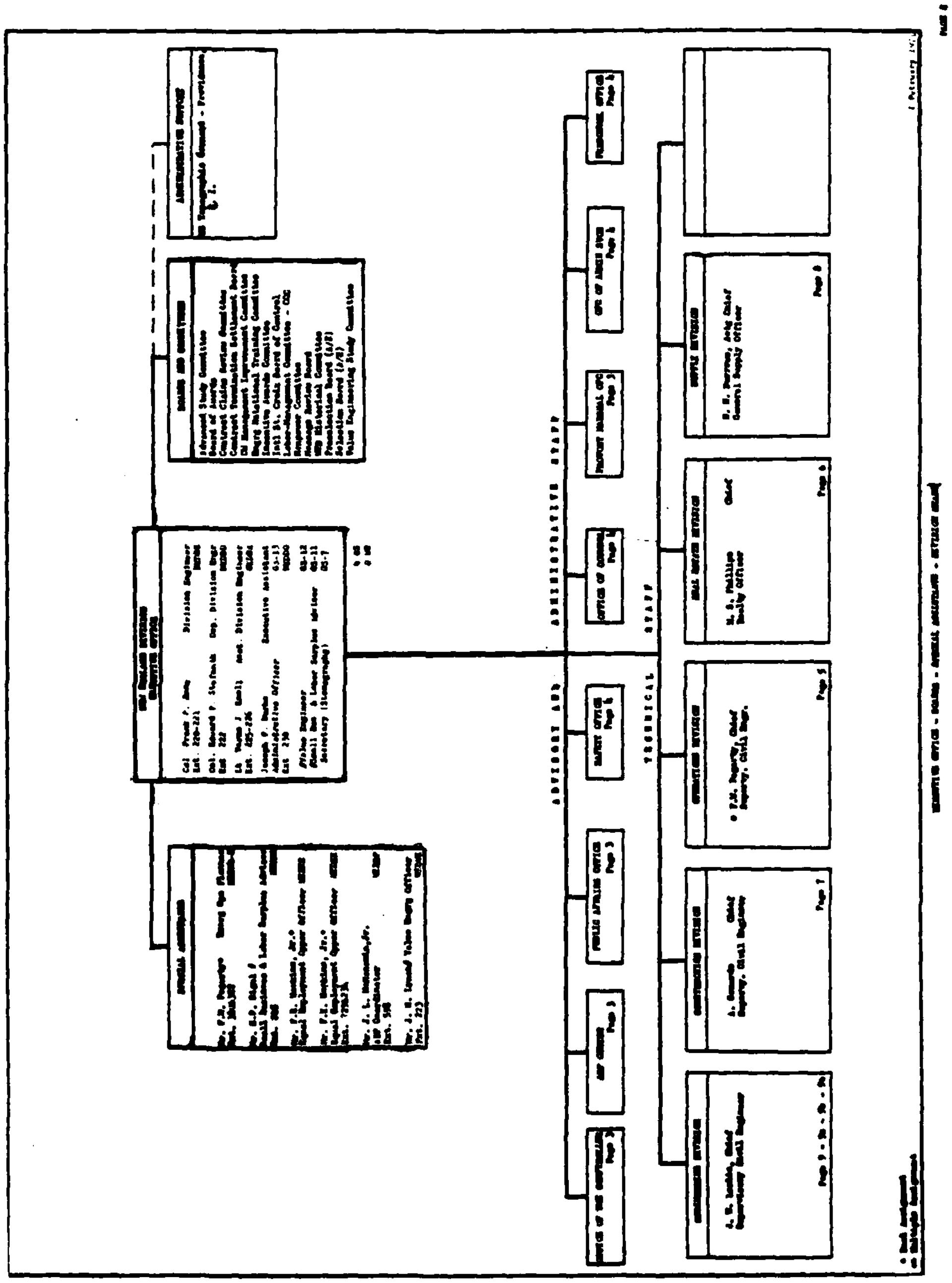
APPENDIX D

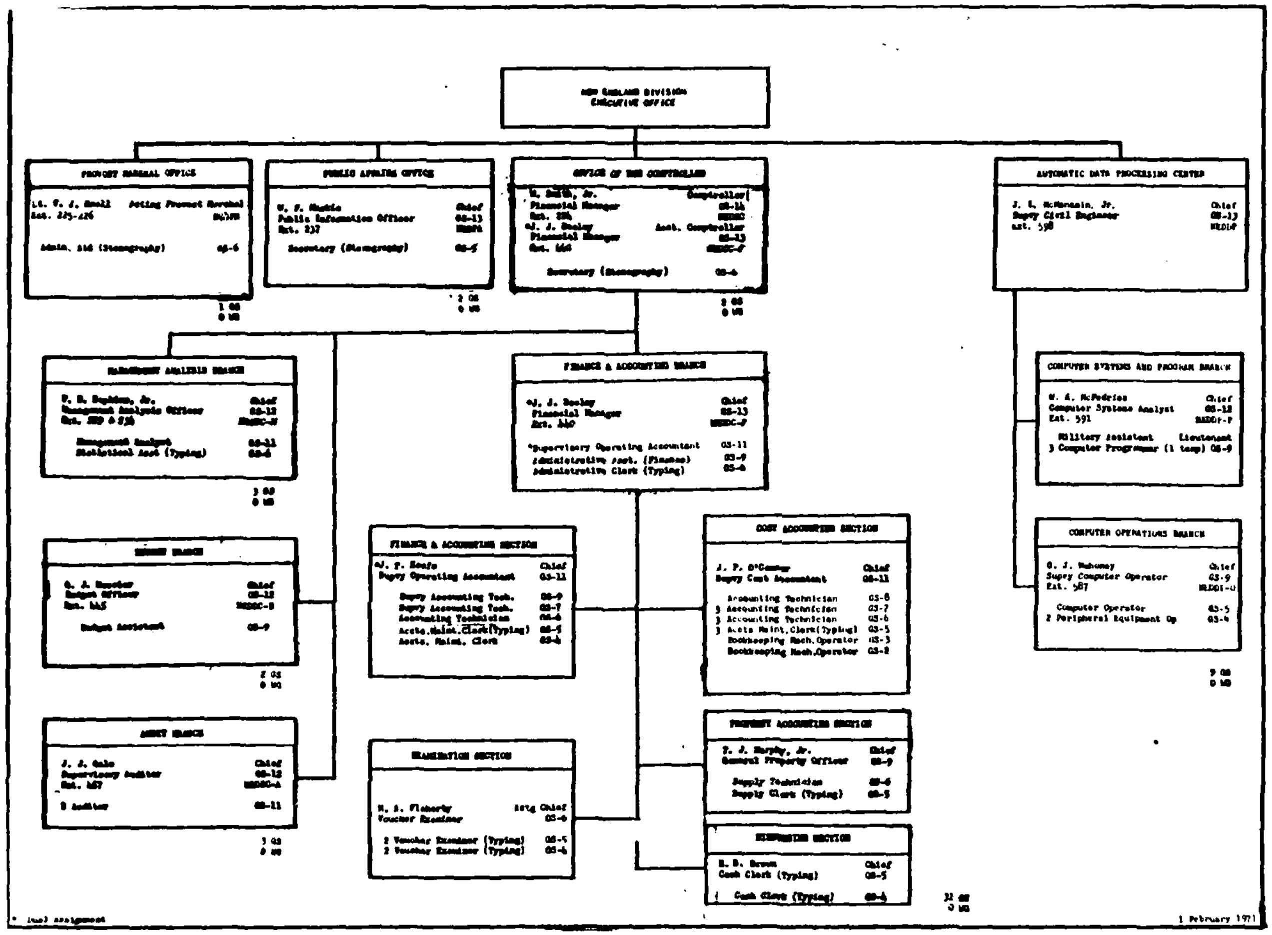
Organization Chart

1 February 1971



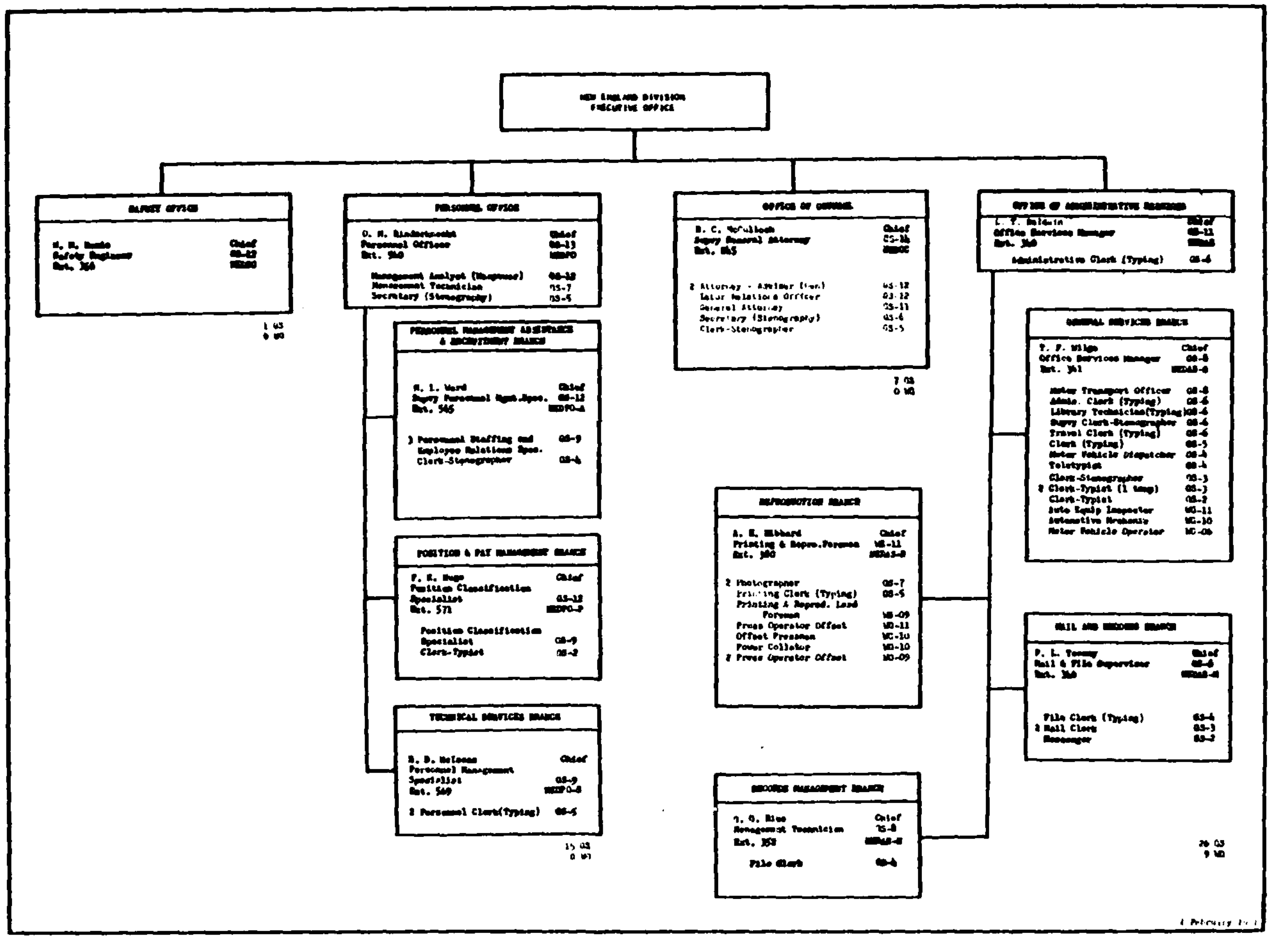

NEW ENGLAND DIVISION
EXECUTIVE OFFICE
Division Engineer
Deputy Division Engineer
Executive Assistant
SPECIAL ASSISTANTS
BOARDS AND COMMITTEES
ADMINISTRATIVE SUPPORT
ADVISORY AND ADMINISTRATIVE STAFF
PUBLIC AFFAIRS OFFICE
SAFETY OFFICE
OFFICE OF COUNSEL
PROVOST MARSHAL OFFICE
OFC OF ADMIN SERVICES
PERSONNEL OFFICE
TECHNICAL STAFF
CONSTRUCTION DIVISION
Office Engineering Branch
Contract Administration Branch
Supervision & Inspection Branch
OPERATIONS DIVISION
Navigation Branch
Reservoir Branch
Permits Branch
Office Operations Branch
REAL ESTATE DIVISION
Appraisal Branch
Plng & Control Branch
Conveyancing Branch
SUPPLY DIVISION
Procurement Branch
Supply Control & Dist Branch
FIELD OFFICES
COMPLETED RESERVOIRS
RIVERS & HARBORS AREA
ANSONIA AREA





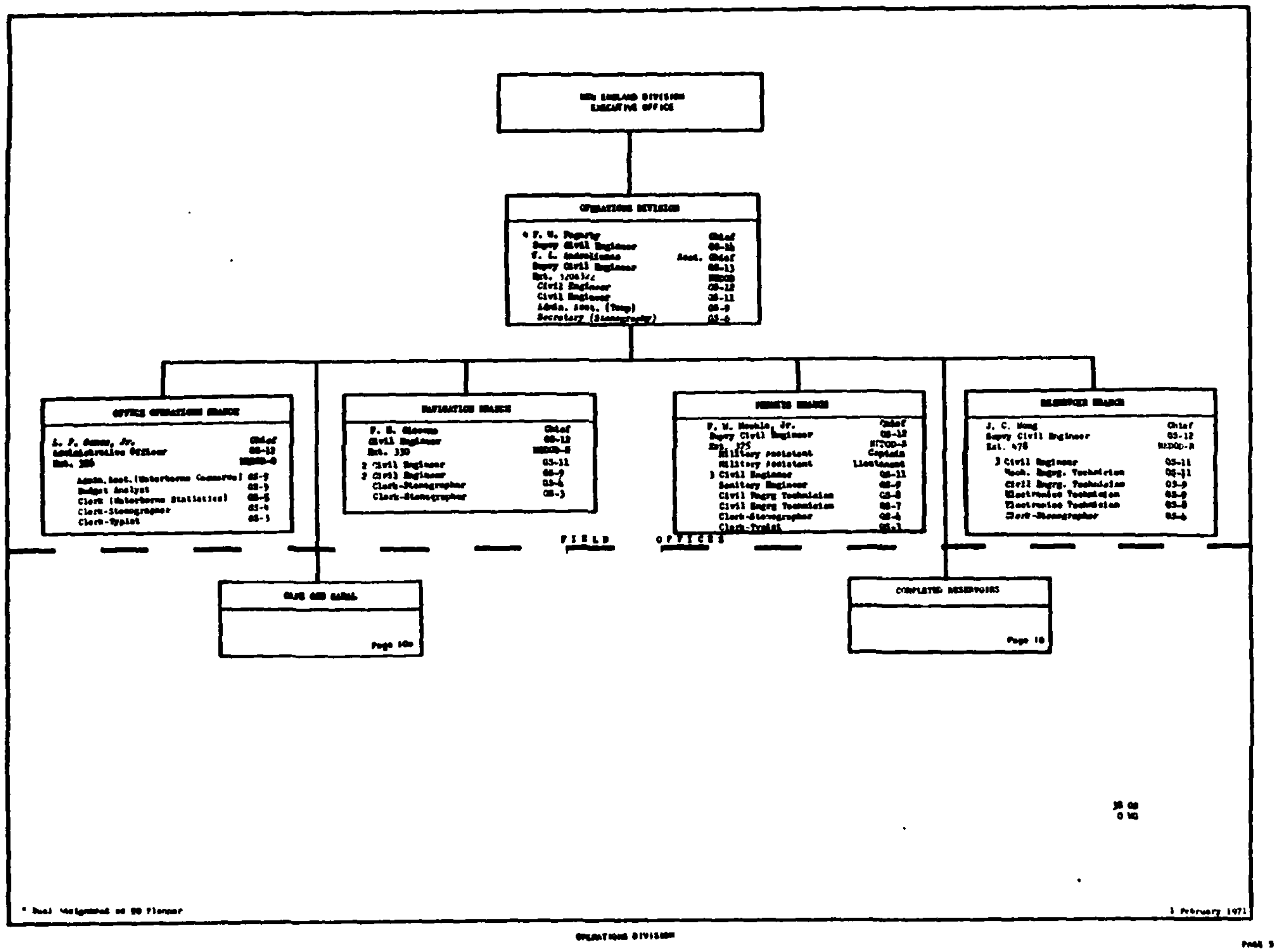
AUTOMATIC DATA PROCESSING CENTER - PUBLIC AFFAIRS OFFICE - OFFICE OF THE COMPTROLLER - PROVOST MARSHAL OFFICE

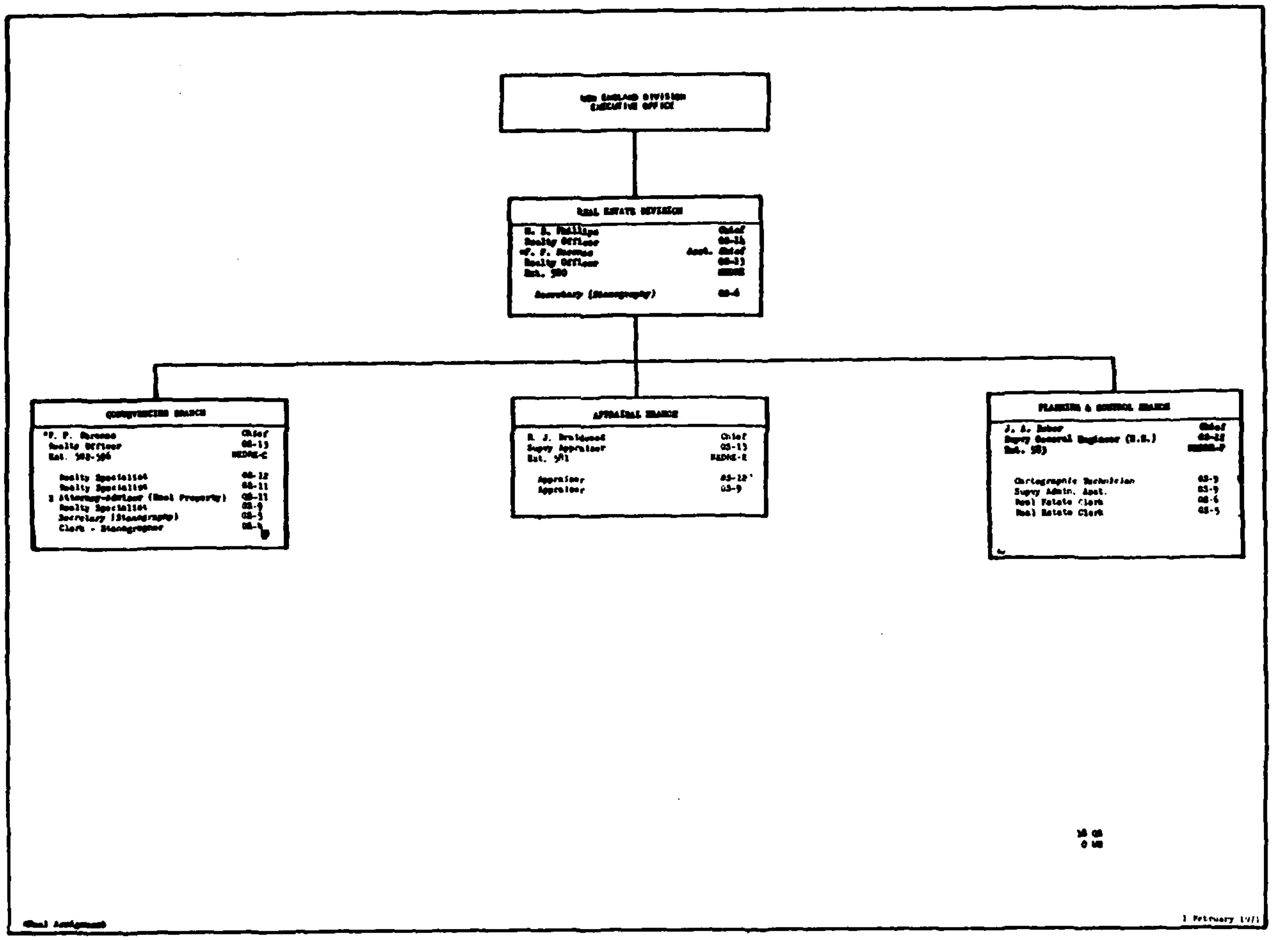
PAGE 3



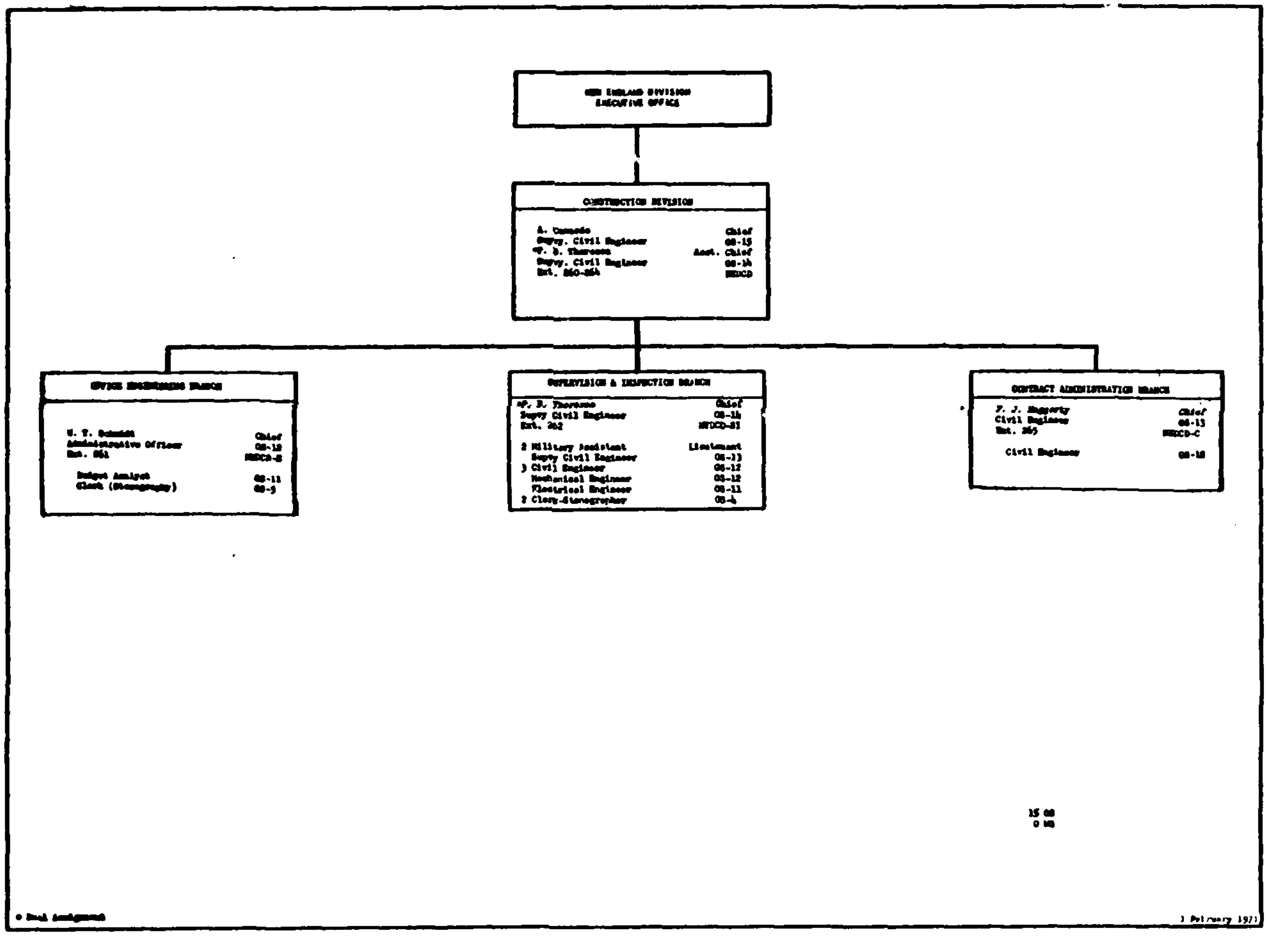
SAFETY OFFICE - PERSONNEL OFFICE - OFFICE OF COUNSEL - OFFICE OF ADMINISTRATIVE SERVICES

PAGE 4

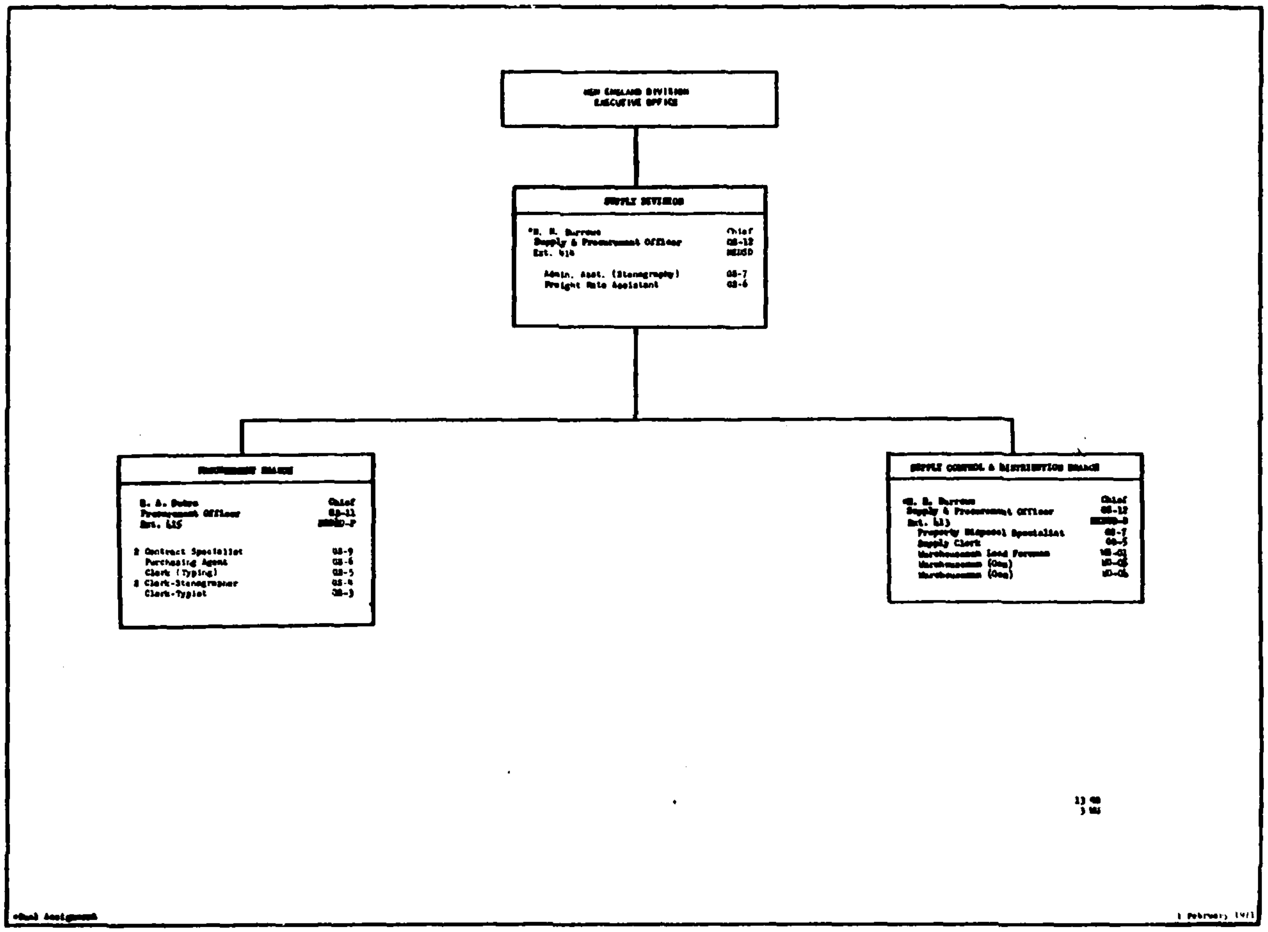

F. W. Mechle, Jr.
Supvy Civil Engineer
Military Assistant
Lieutenant
Civil Engrg Technician
GS-7
Clerk-Stenographer
J. C. Wong
Chief
Supvy Civil Engineer
GS-12
3 Civil Engineer
GS-11
Civil Engineer
Clerk-Stenographer
Clerk-Typist
F I E L D
O F F I C E S
COMPLETED RESERVOIRS
Page 10
1 February 1971



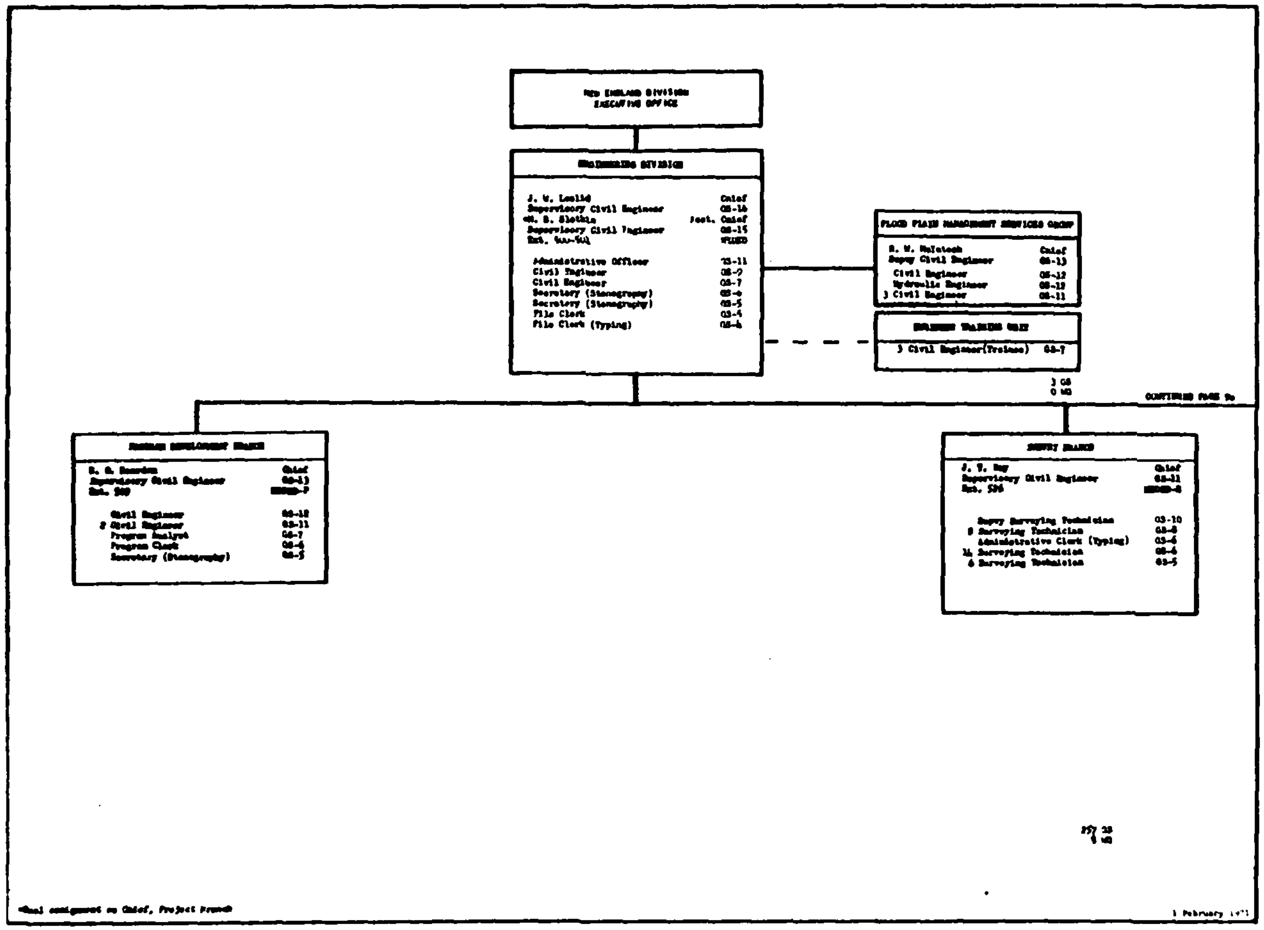
REAL ESTATE DIVISION



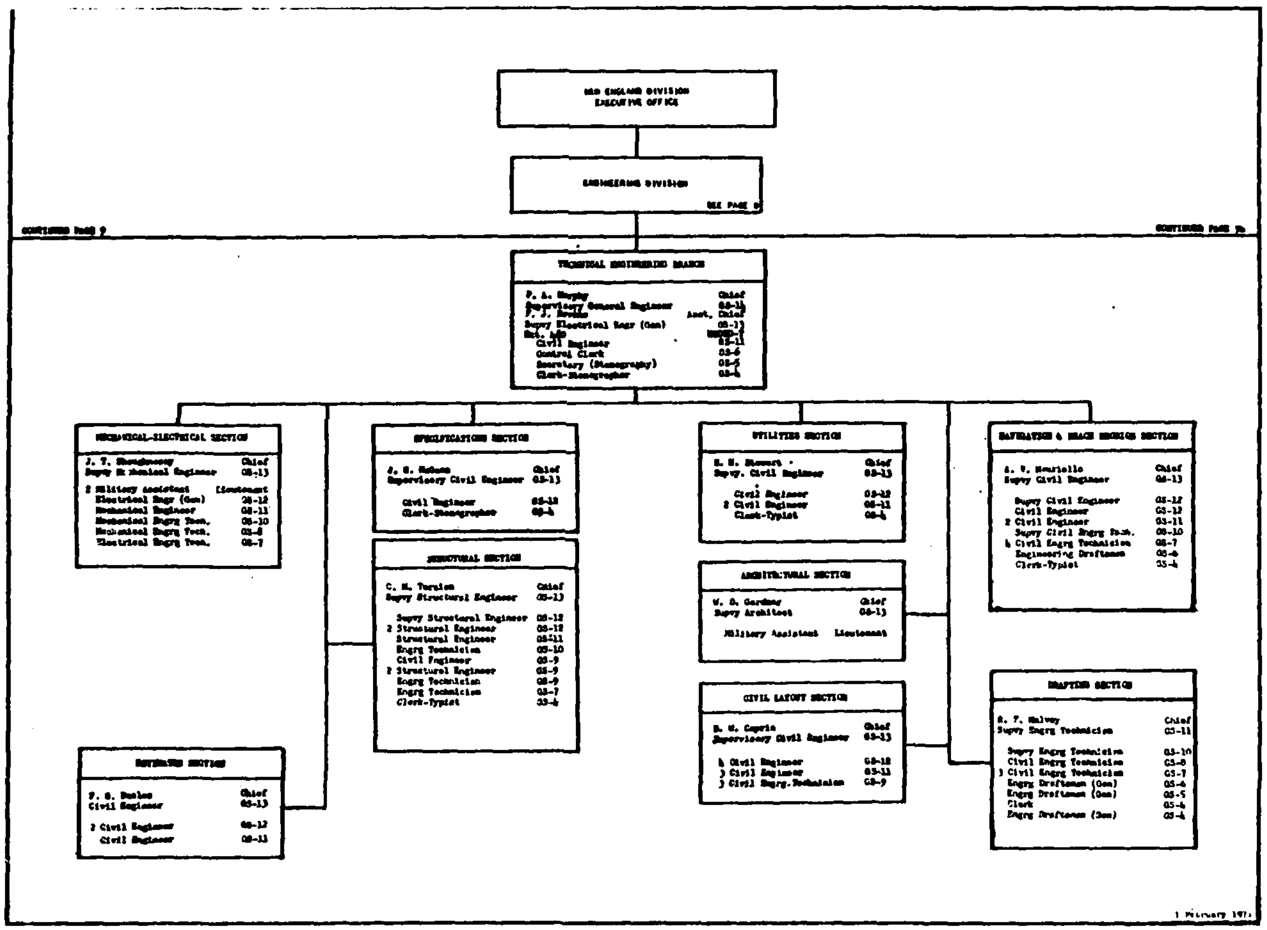
CONSTRUCTION DIVISION



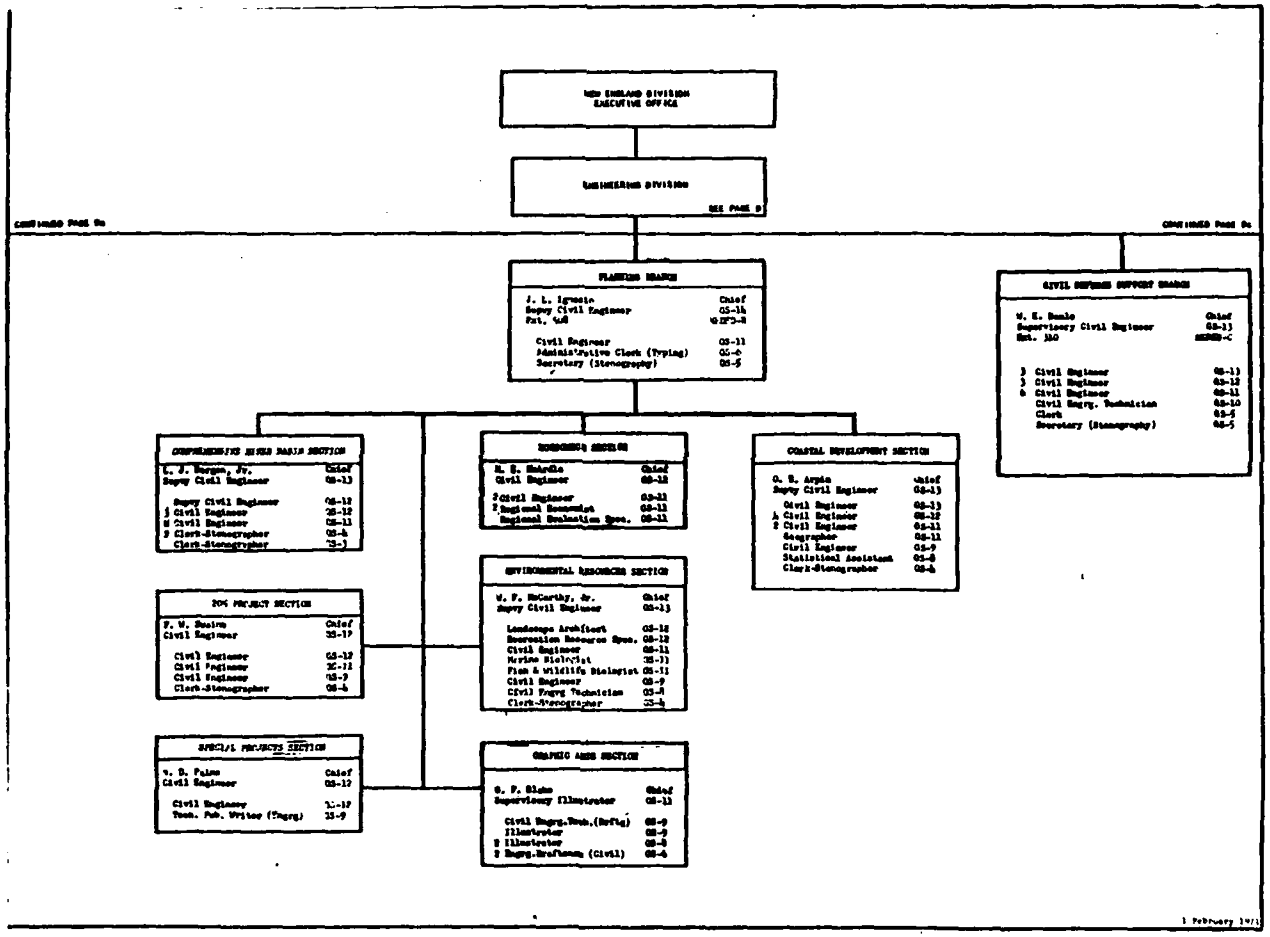
SUPPLY DIVISION



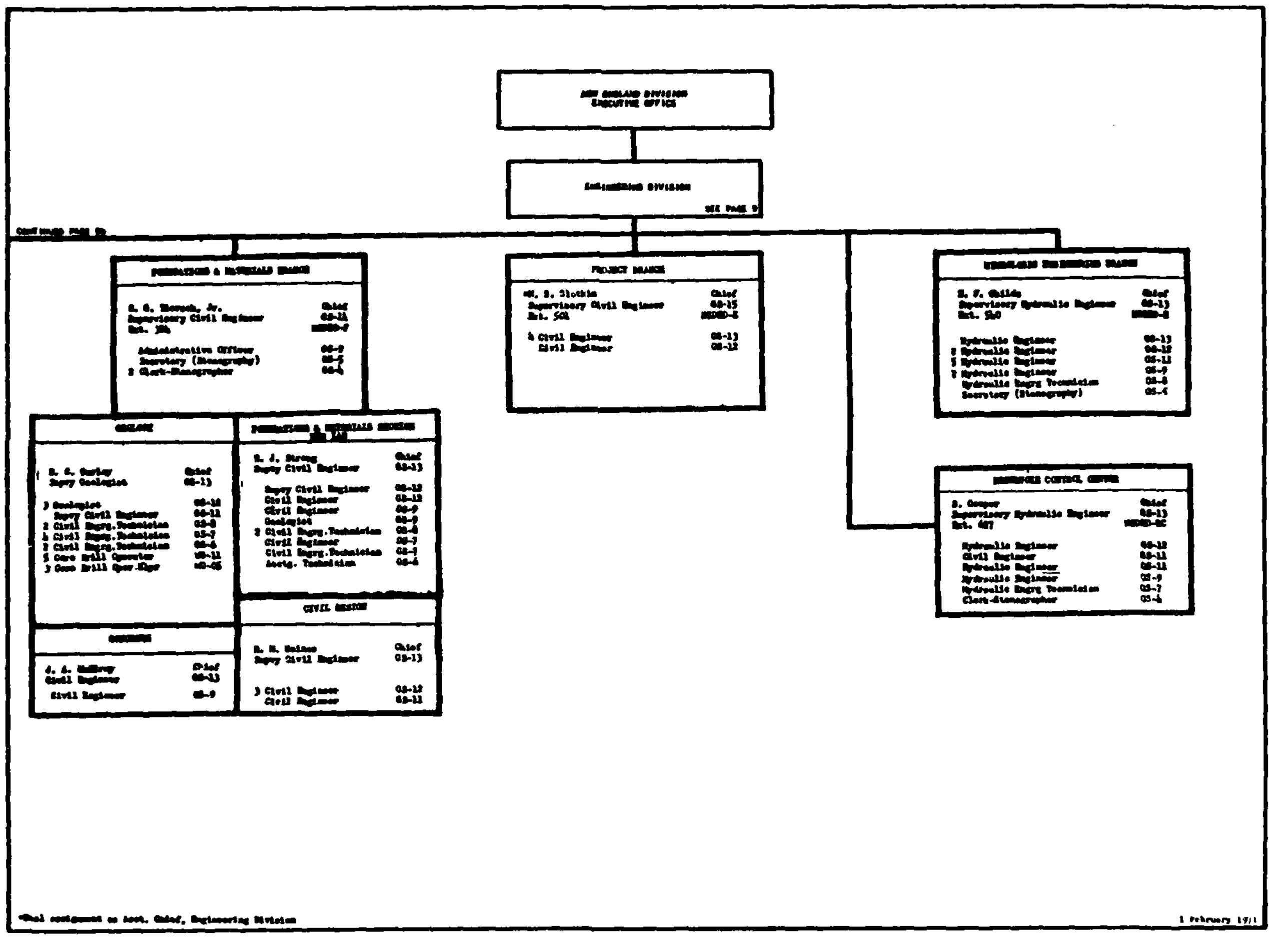
ENGINEERING DIVISION PROGRAM DEVELOPMENT BRANCH - SURVEY BRANCH



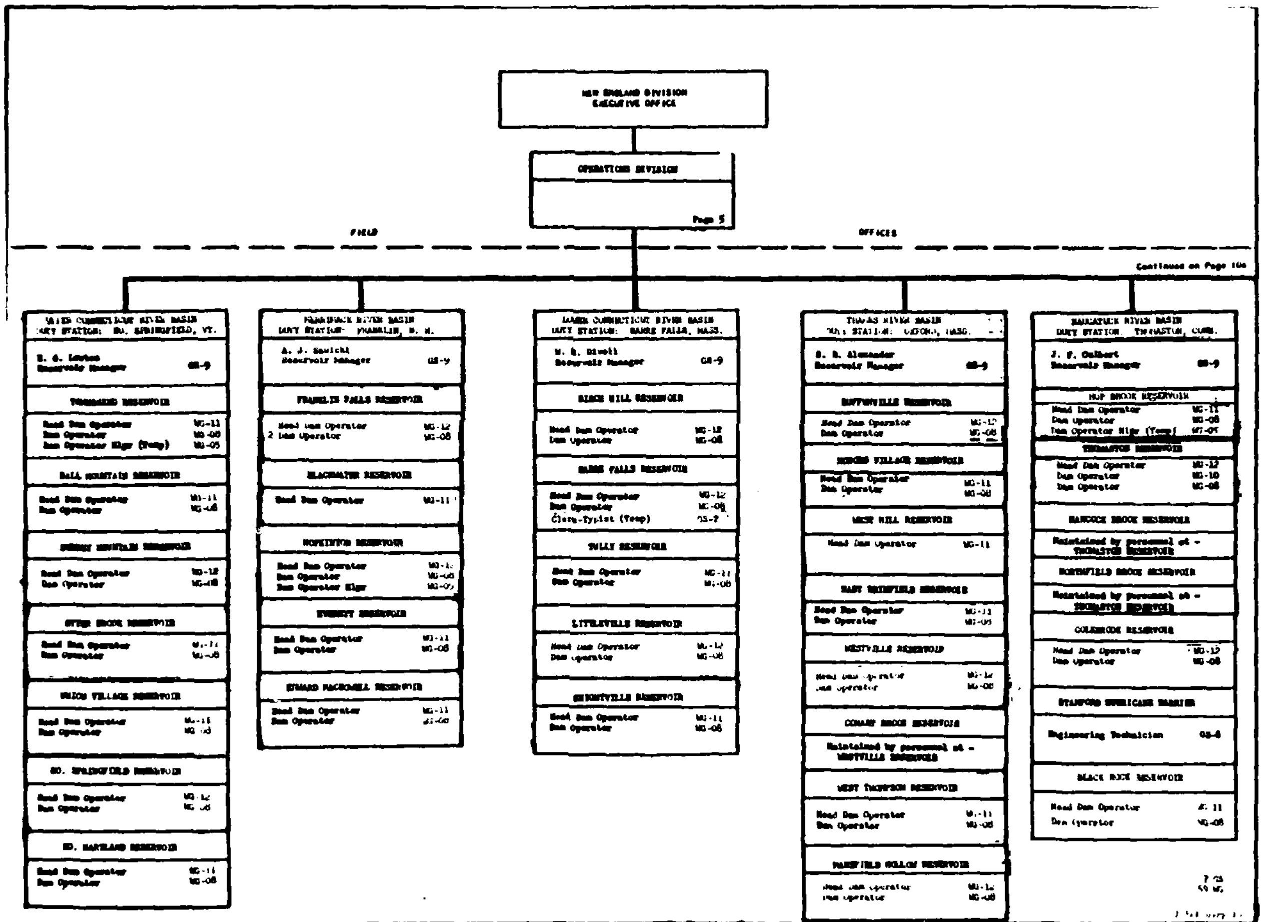
ENGINEERING DIVISION: TECHNICAL ENGINEERING BRANCH

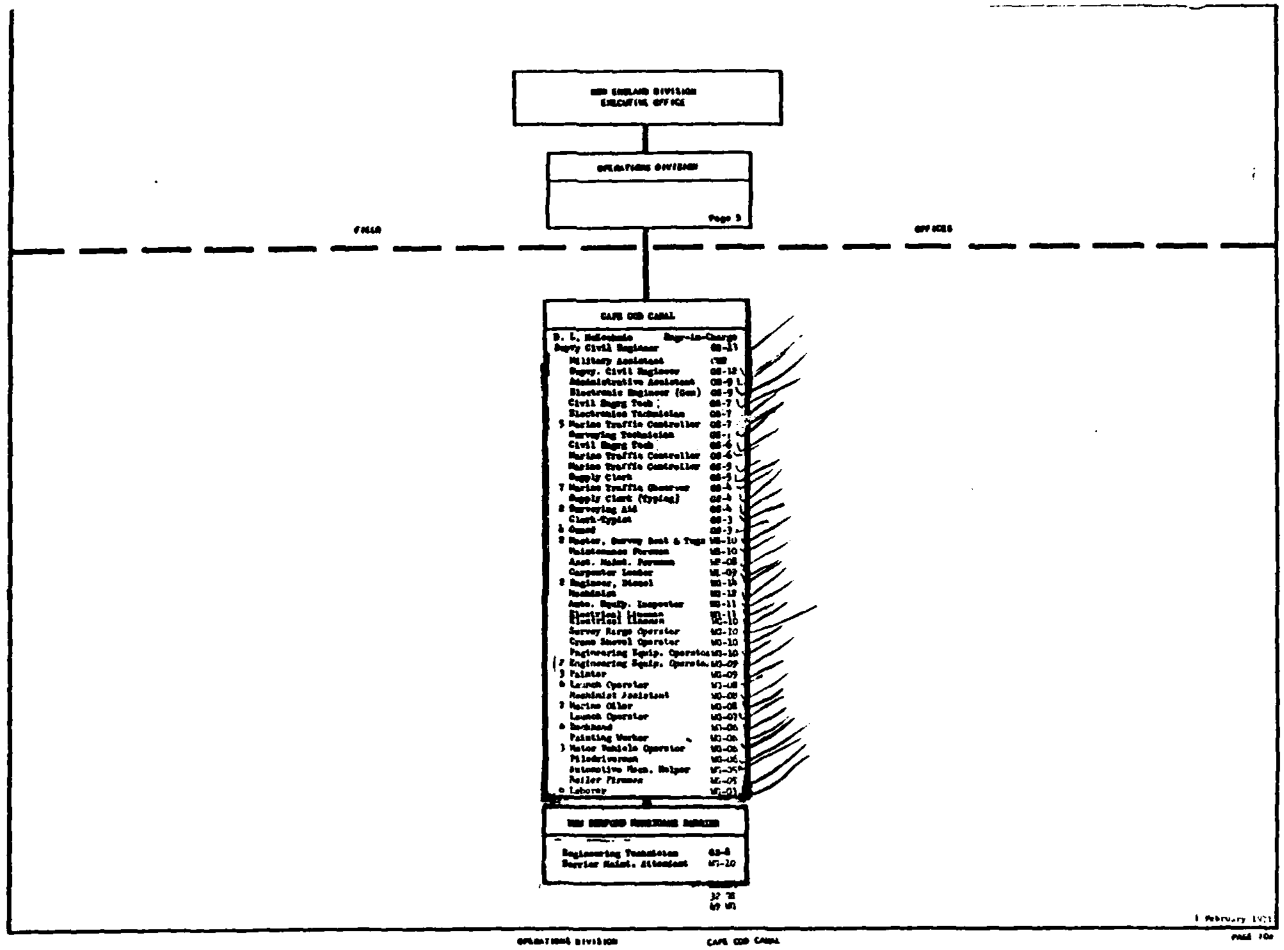


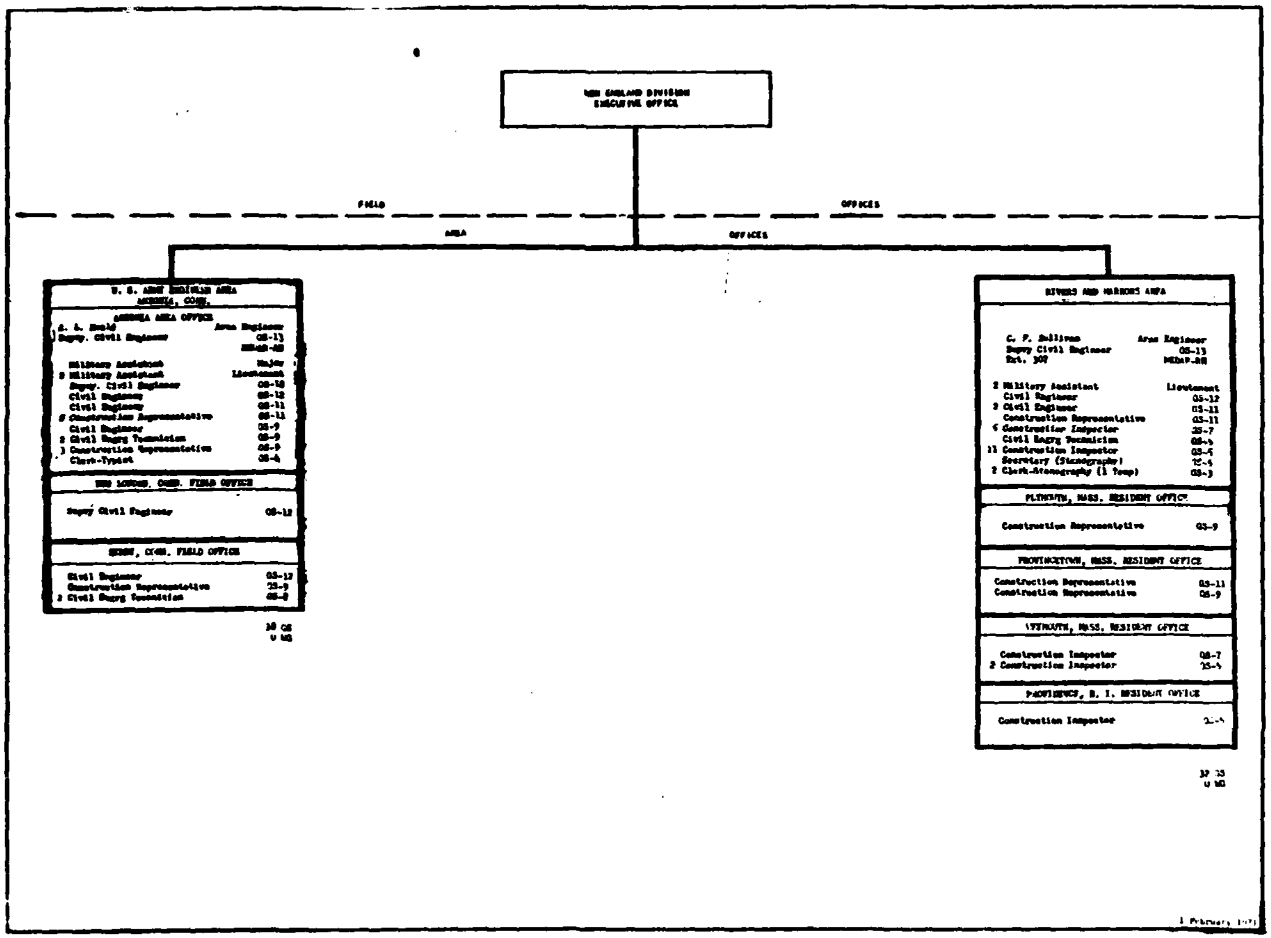
ENGINEERING DIVISION: PLANNING BRANCH - CIVIL DEFENSE SUPPORT BRANCH



ENGINEERING DIVISION: FOUNDATIONS & MATERIALS BRANCH - PROJECT BRANCH - HYDROLOGIC ENGINEERING BRANCH - RESERVOIR CONTROL CENTER


NEW ENGLAND DIVISION
EXECUTIVE OFFICE
OPERATIONS DIVISION
Page 5
FIELD
OFFICES
Continued on Page 10a
UPPER CONNECTICUT RIVER BASIN
DUTY STATION: NO. SPRINGFIELD, VT.
Reservoir Manager GS-9
TOWNSHEND RESERVOIR
Head Dam Operator WG-11
Dam Operator WG-08
Dam Operator Hlpr (Temp) WG-05
BALL MOUNTAIN RESERVOIR
Head Dam Operator WG-11
Dam Operator WG-08
SURRY MOUNTAIN RESERVOIR
Head Dam Operator WG-12
Dam Operator WG-08
OTTER BROOK RESERVOIR
Head Dam Operator
Dam Operator
UNION VILLAGE RESERVOIR
Head Dam Operator
Dam Operator
NO. SPRINGFIELD RESERVOIR
Head Dam Operator
Dam Operator
NO. HARTLAND RESERVOIR
Head Dam Operator WG-11
Dam Operator WG-08
MERRIMACK RIVER BASIN
DUTY STATION: FRANKLIN, N. H.
A. J. Sawicki
Reservoir Manager GS-9
FRANKLIN FALLS RESERVOIR
Head Dam Operator WG-12
2 Dam Operator WG-08
BLACKWATER RESERVOIR
Head Dam Operator WG-11
HOPKINTON RESERVOIR
Head Dam Operator
Dam Operator WG-08
Dam Operator Hlpr
EVERETT RESERVOIR
Head Dam Operator
Dam Operator WG-08
EDWARD MACDOWELL RESERVOIR
Head Dam Operator WG-11
Dam Operator
LOWER CONNECTICUT RIVER BASIN
DUTY STATION: BARRE FALLS, MASS.
Reservoir Manager GS-9
BIRCH HILL RESERVOIR
Head Dam Operator WG-12
Dam Operator WG-08
BARRE FALLS RESERVOIR
Head Dam Operator WG-12
Dam Operator WG-08
Clerk-Typist (Temp) GS-2
TULLY RESERVOIR
Head Dam Operator
Dam Operator WG-08
LITTLEVILLE RESERVOIR
Head Dam Operator WG-12
Dam Operator WG-08
KNIGHTVILLE RESERVOIR
Head Dam Operator WG-11
Dam Operator WG-08
THAMES RIVER BASIN
DUTY STATION:
Reservoir Manager GS-9
BUFFUMVILLE RESERVOIR
Head Dam Operator
Dam Operator WG-08
HODGES VILLAGE RESERVOIR
Head Dam Operator WG-11
Dam Operator WG-08
WEST HILL RESERVOIR
Head Dam Operator WG-11
EAST BRIMFIELD RESERVOIR
Head Dam Operator
Dam Operator
WESTVILLE RESERVOIR
Head Dam Operator
Dam Operator WG-08
CONANT BROOK RESERVOIR
Maintained by personnel at -
WESTVILLE RESERVOIR
WEST THOMPSON RESERVOIR
Head Dam Operator
Dam Operator WG-08
MANSFIELD HOLLOW RESERVOIR
Head Dam Operator
Dam Operator WG-08
NAUGATUCK RIVER BASIN
DUTY STATION: THOMASTON, CONN.
Reservoir Manager GS-9
HOP BROOK RESERVOIR
Head Dam Operator
Dam Operator WG-08
Dam Operator Hlpr (Temp)
THOMASTON RESERVOIR
Head Dam Operator WG-12
Dam Operator WG-10
Dam Operator WG-08
HANCOCK BROOK RESERVOIR
Maintained by personnel at -
THOMASTON RESERVOIR
NORTHFIELD BROOK RESERVOIR
Maintained by personnel at -
THOMASTON RESERVOIR
COLEBROOK RESERVOIR
Head Dam Operator WG-12
Dam Operator WG-08
STAMFORD HURRICANE BARRIER
Engineering Technician GS-6
BLACK ROCK RESERVOIR
Head Dam Operator
Dam Operator WG-08


NEW ENGLAND DIVISION
EXECUTIVE OFFICE
OPERATIONS DIVISION
Page 3
FIELD
OFFICES
CAPE COD CANAL
Engr-in-Charge
Deputy Civil Engineer
Military Assistant
Administrative Assistant
Electronic Engineer (Gen)
Civil Engrg Tech
Electronics Technician
Marine Traffic Controller
Surveying Technician
Supply Clerk
Marine Traffic Observer
Supply Clerk (Typing)
Surveying Aid
Clerk-Typist
Guard
Master, Survey Boat & Tugs
Maintenance Foreman
Asst. Maint. Foreman
Carpenter Leader
Engineer, Diesel
Machinist
Auto. Equip. Inspector
Electrical Lineman
Survey Barge Operator
Crane Shovel Operator
Engineering Equip. Operator
Painter
Launch Operator
Machinist Assistant
Marine Oiler
Deckhand
Painting Worker
Motor Vehicle Operator
Piledriverman
Automotive Mech. Helper
Boiler Fireman
Laborer
Engineering Technician
Barrier Maint. Attendant
OPERATIONS DIVISION
CAPE COD CANAL

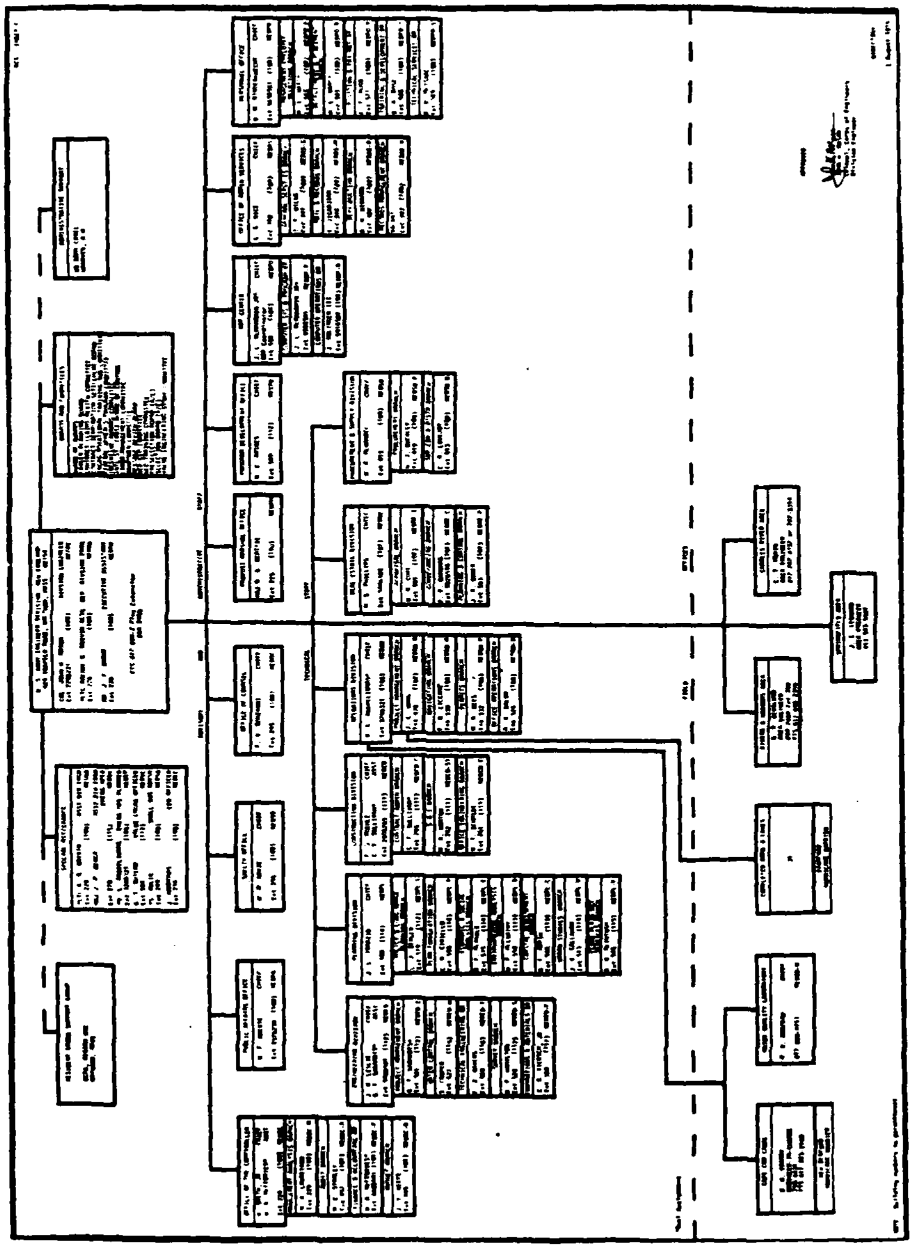


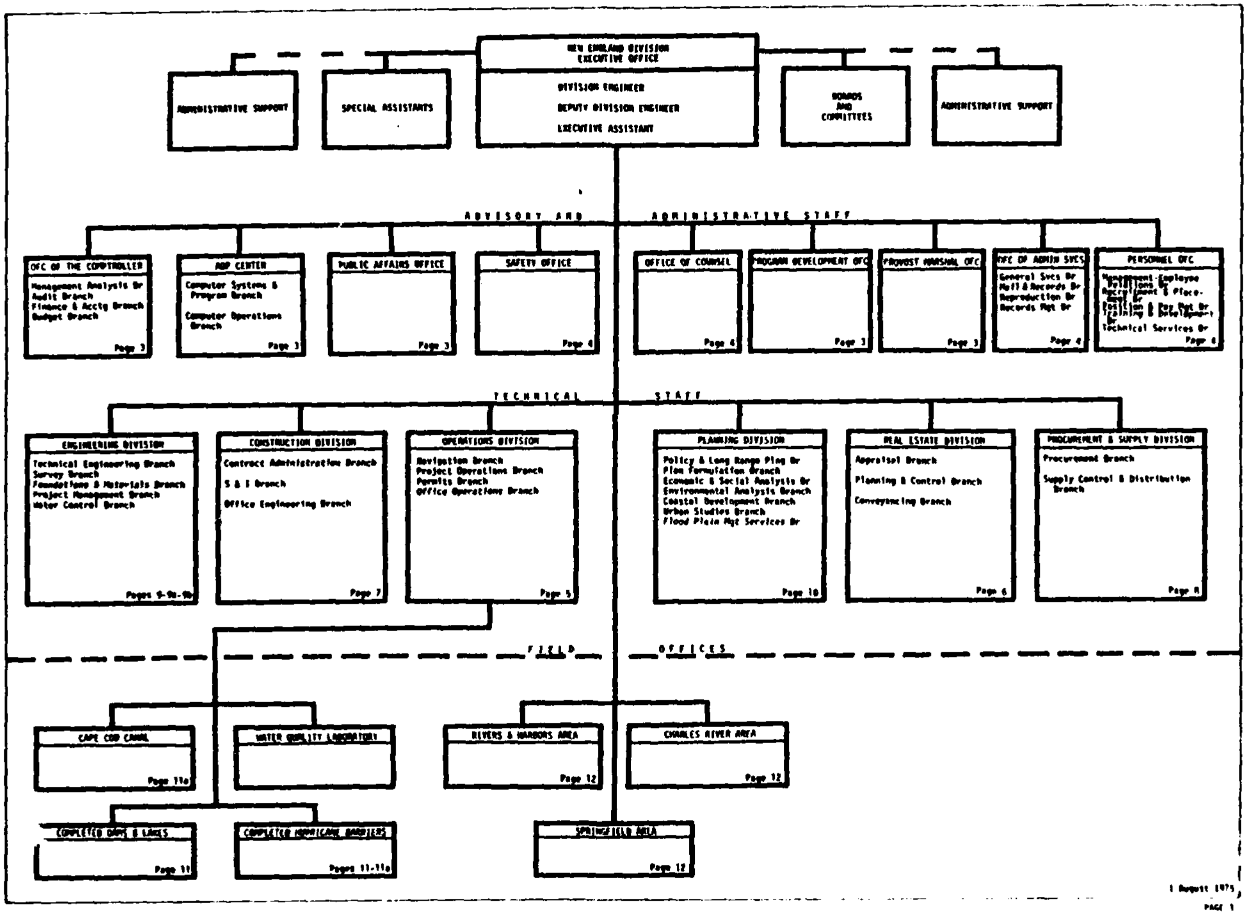
AREA OFFICES: ANSONIA - RIVERS & HARBORS

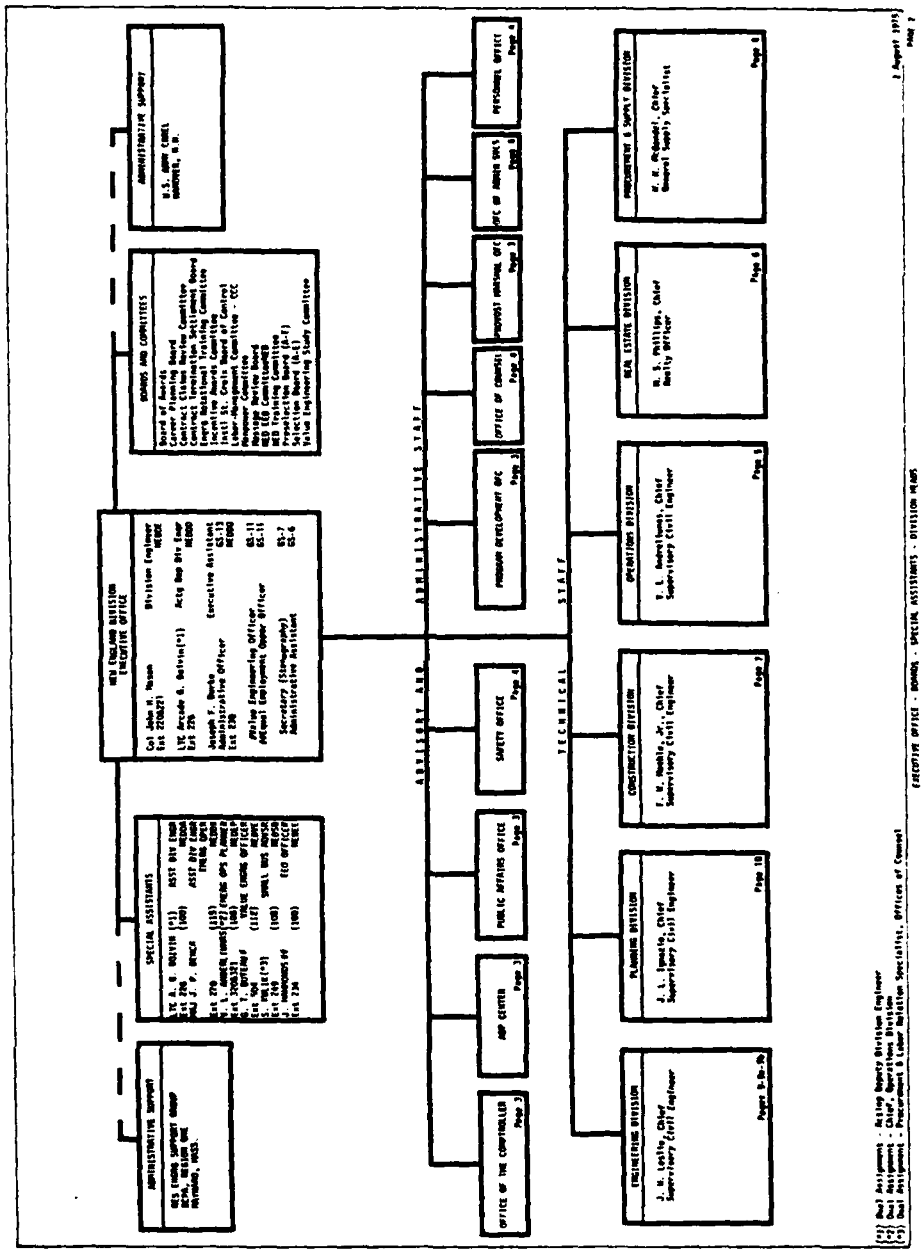
APPENDIX E

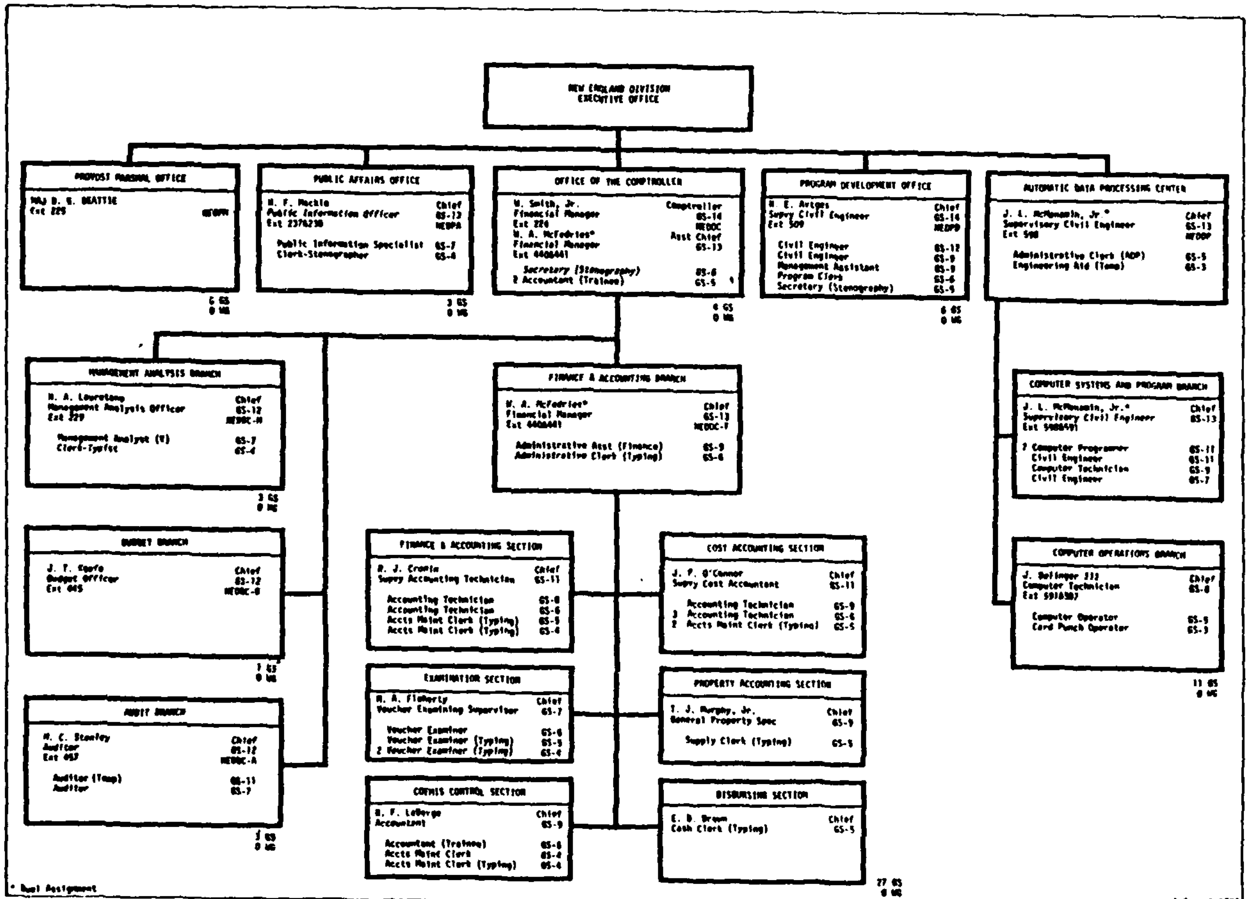
Organization Chart

1 August 1975




NEW ENGLAND DIVISION
EXECUTIVE OFFICE
DIVISION ENGINEER
DEPUTY DIVISION ENGINEER
EXECUTIVE ASSISTANT
ADMINISTRATIVE SUPPORT
SPECIAL ASSISTANTS
BOARDS AND COMMITTEES
ADMINISTRATIVE SUPPORT
ADVISORY AND ADMINISTRATIVE STAFF
OFC OF THE COMPTROLLER
Management Analysis Br
Audit Branch
Finance & Acctg Branch
Budget Branch
Page 3
ADP CENTER
Computer Systems & Program Branch
Computer Operations Branch
Page 3
PUBLIC AFFAIRS OFFICE
Page 3
SAFETY OFFICE
Page 4
OFFICE OF COUNSEL
Page 4
PROGRAM DEVELOPMENT OFC
Page 3
PROVOST MARSHAL OFC
Page 3
OFC OF ADMIN SVCS
General Svcs Br
Mail & Records Br
Reproduction Br
Records Mgt Br
Page 4
PERSONNEL OFC
Technical Services Br
Page 4
TECHNICAL STAFF
ENGINEERING DIVISION
Technical Engineering Branch
Survey Branch
Foundations & Materials Branch
Project Management Branch
Water Control Branch
Pages 9-9a-9b
CONSTRUCTION DIVISION
Contract Administration Branch
S & I Branch
Office Engineering Branch
Page 7
OPERATIONS DIVISION
Navigation Branch
Project Operations Branch
Permits Branch
Office Operations Branch
Page 5
PLANNING DIVISION
Policy & Long Range Plng Br
Plan Formulation Branch
Economic & Social Analysis Br
Environmental Analysis Branch
Coastal Development Branch
Urban Studies Branch
Flood Plain Mgt Services Br
Page 10
REAL ESTATE DIVISION
Appraisal Branch
Planning & Control Branch
Conveyancing Branch
Page 6
PROCUREMENT & SUPPLY DIVISION
Procurement Branch
Supply Control & Distribution Branch
Page 8
FIELD OFFICES
CAPE COD CANAL
Page 11a
WATER QUALITY LABORATORY
RIVERS & HARBORS AREA
Page 12
CHARLES RIVER AREA
Page 12
COMPLETED DAMS & LAKES
Page 11
COMPLETED HURRICANE BARRIERS
Pages 11-11a
SPRINGFIELD AREA
Page 12
1 August 1975
PAGE 1





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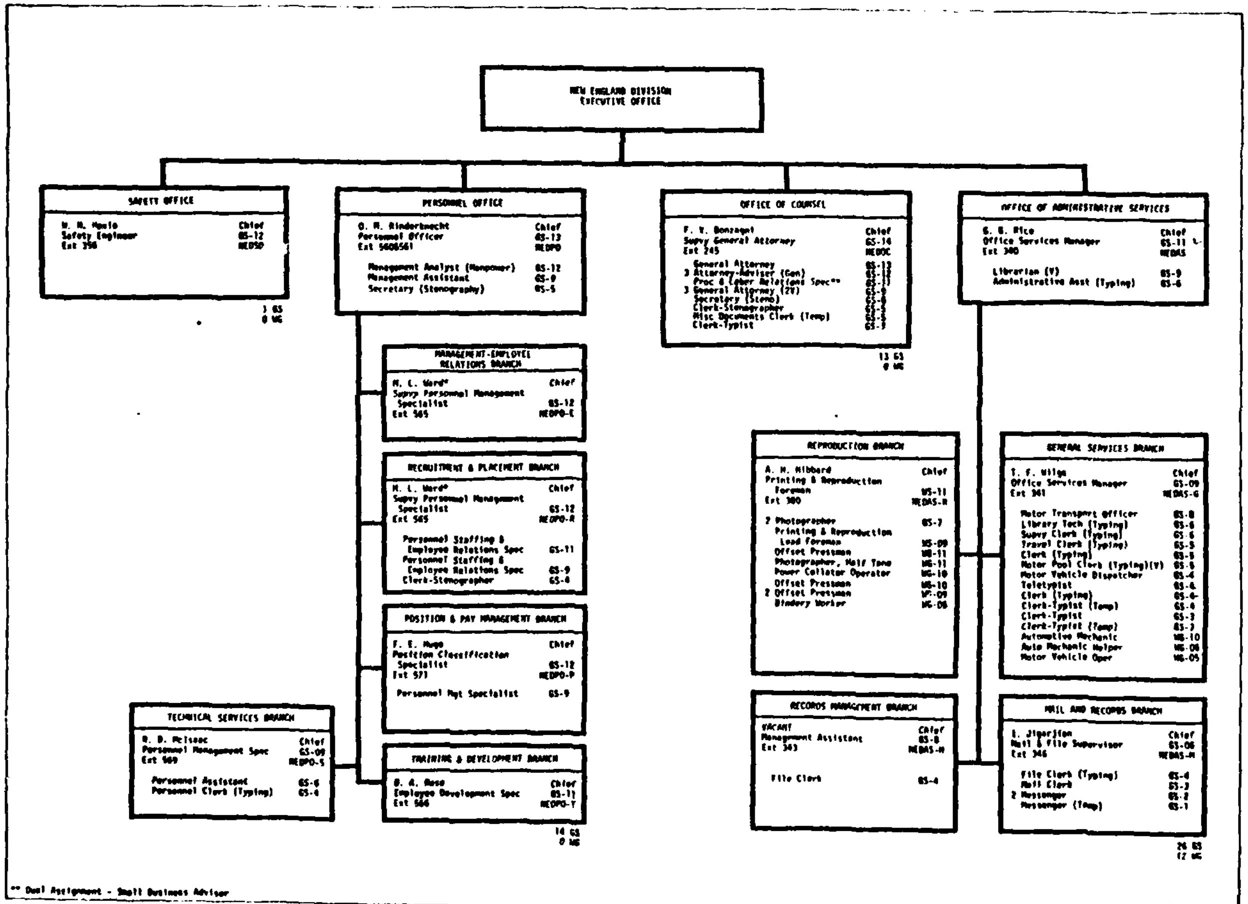

SAFETY OFFICE - PERSONNEL OFFICE - OFFICE OF COUNSEL - OFFICE OF ADMINISTRATIVE SERVICES

1 August 1975
PAGE 4

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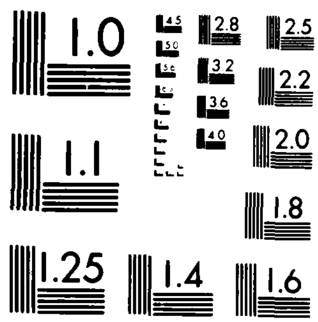

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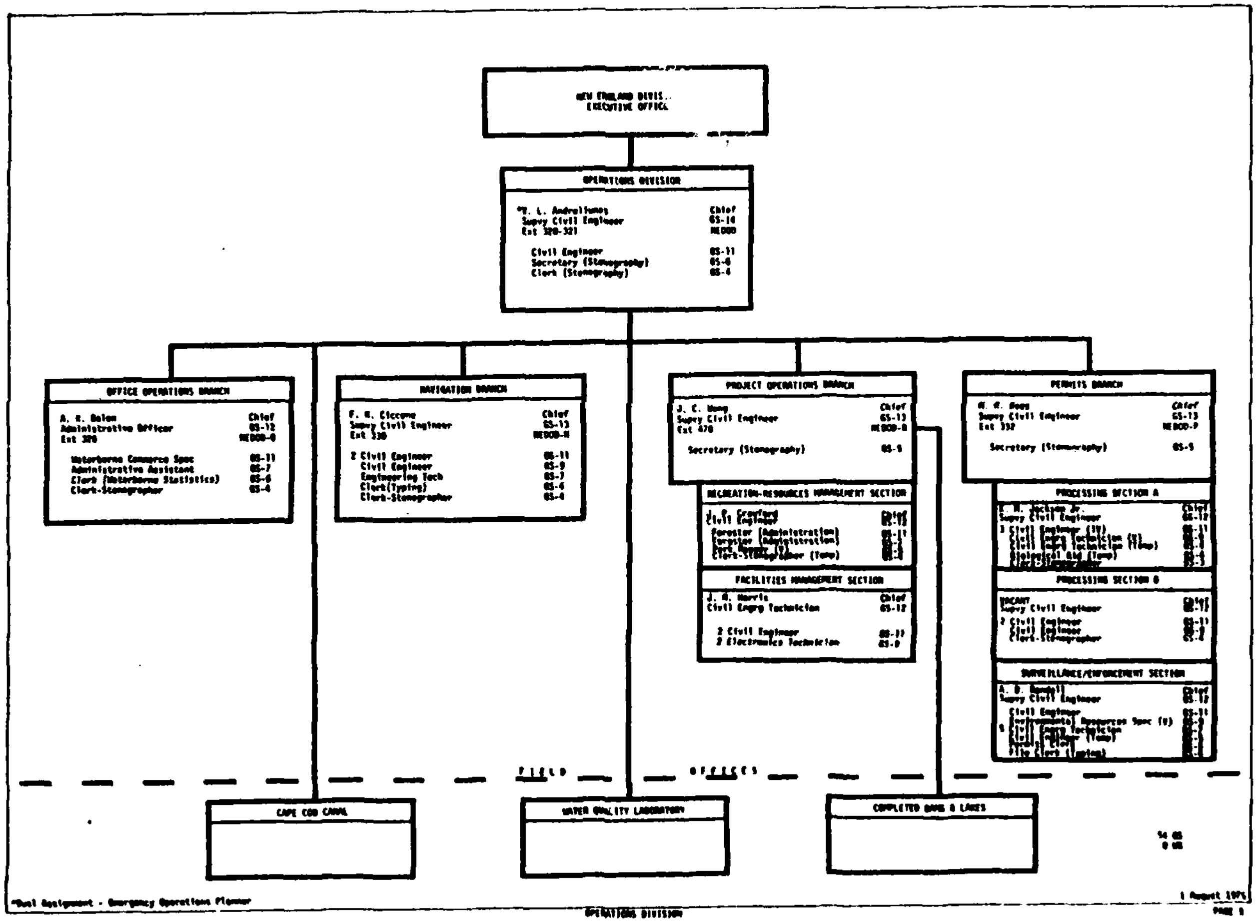
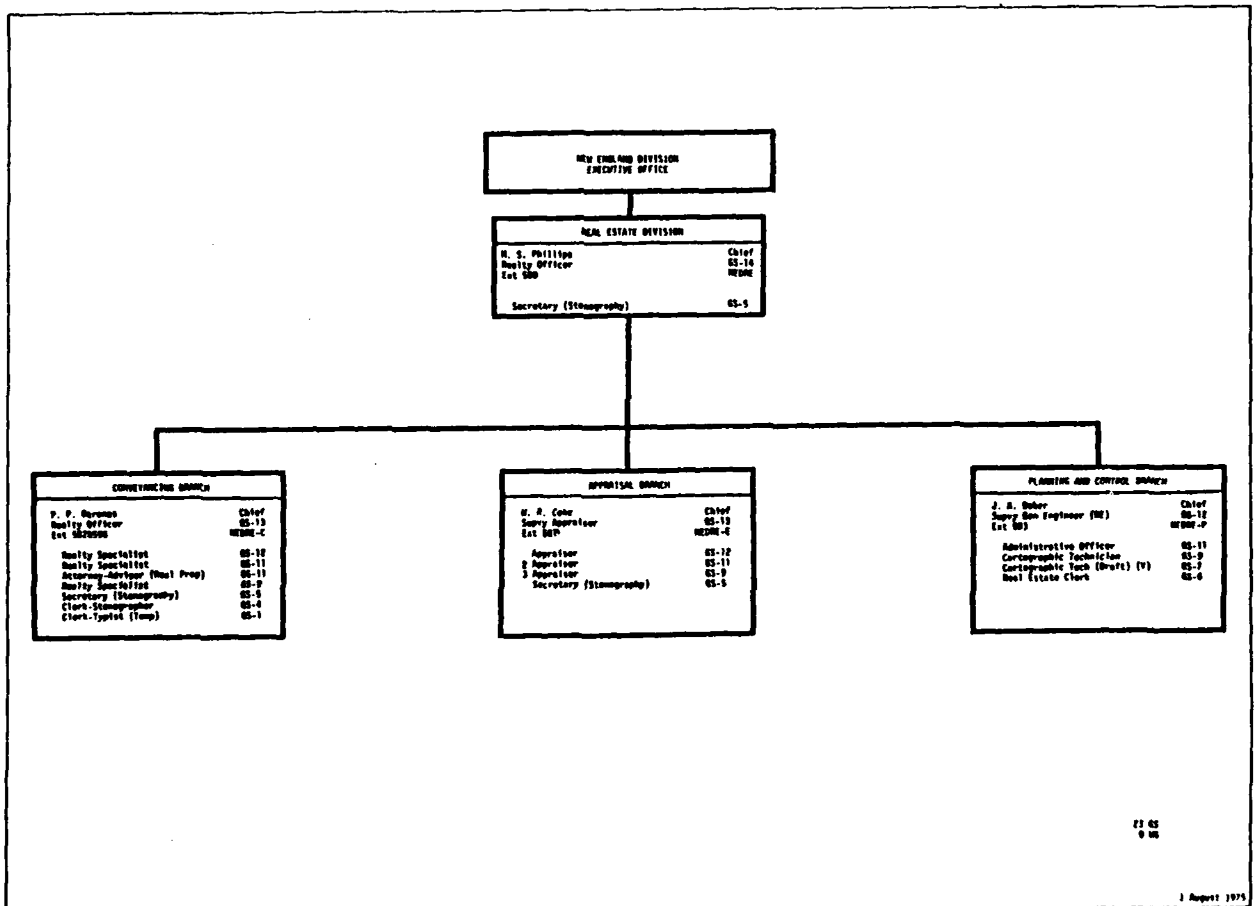

NEW ENGLAND DIVIS..
EXECUTIVE OFFICE
OPERATIONS DIVISION
*V. L. Andreliunas Chief
Supvy Civil Engineer GS-14
Ext 320-321 NEDOD
Civil Engineer GS-11
Secretary (Stenography) GS-6
Clerk (Stenography) GS-4
OFFICE OPERATIONS BRANCH
A. R. Balon Chief
Administrative Officer GS-12
Ext 320 NEDOD-O
Waterborne Commerce Spec GS-11
Administrative Assistant GS-7
Clerk (Waterborne Statistics) GS-6
Clerk-Stenographer GS-4
NAVIGATION BRANCH
F. R. Ciccone Chief
Supvy Civil Engineer GS-13
Ext 330 NEDOD-N
2 Civil Engineer GS-11
Civil Engineer GS-9
Engineering Tech GS-7
Clerk(Typing) GS-6
Clerk-Stenographer GS-4
PROJECT OPERATIONS BRANCH
J. C. Wong Chief
Supvy Civil Engineer GS-13
Ext 470 NEDOD-R
Secretary (Stenography) GS-5
RECREATION-RESOURCES MANAGEMENT SECTION
FACILITIES MANAGEMENT SECTION
J. A. Harris Chief
Civil Engrg Technician GS-12
2 Civil Engineer GS-11
2 Electronics Technician GS-9
PERMITS BRANCH
Chief
Supvy Civil Engineer GS-13
Ext 332 NEDOD-P
Secretary (Stenography) GS-5
PROCESSING SECTION A
PROCESSING SECTION B
VACANT
Supvy Civil Engineer
SURVEILLANCE/ENFORCEMENT SECTION
FIELD OFFICES
CAPE COD CANAL
WATER QUALITY LABORATORY
COMPLETED DAMS & LAKES
*Dual Assignment - Emergency Operations Planner
OPERATIONS DIVISION
PAGE 1



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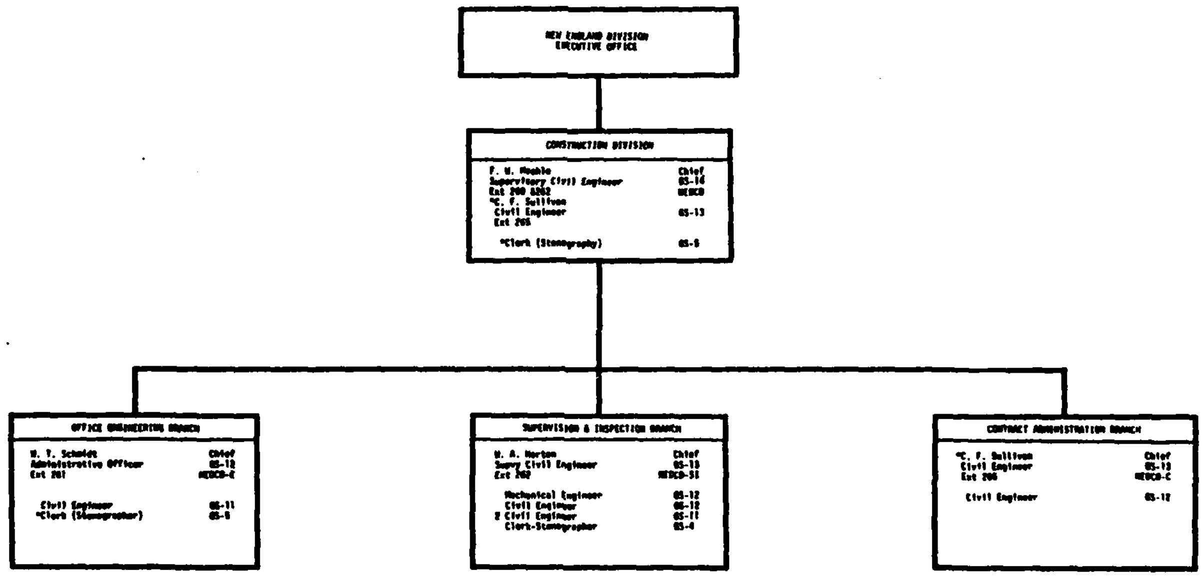

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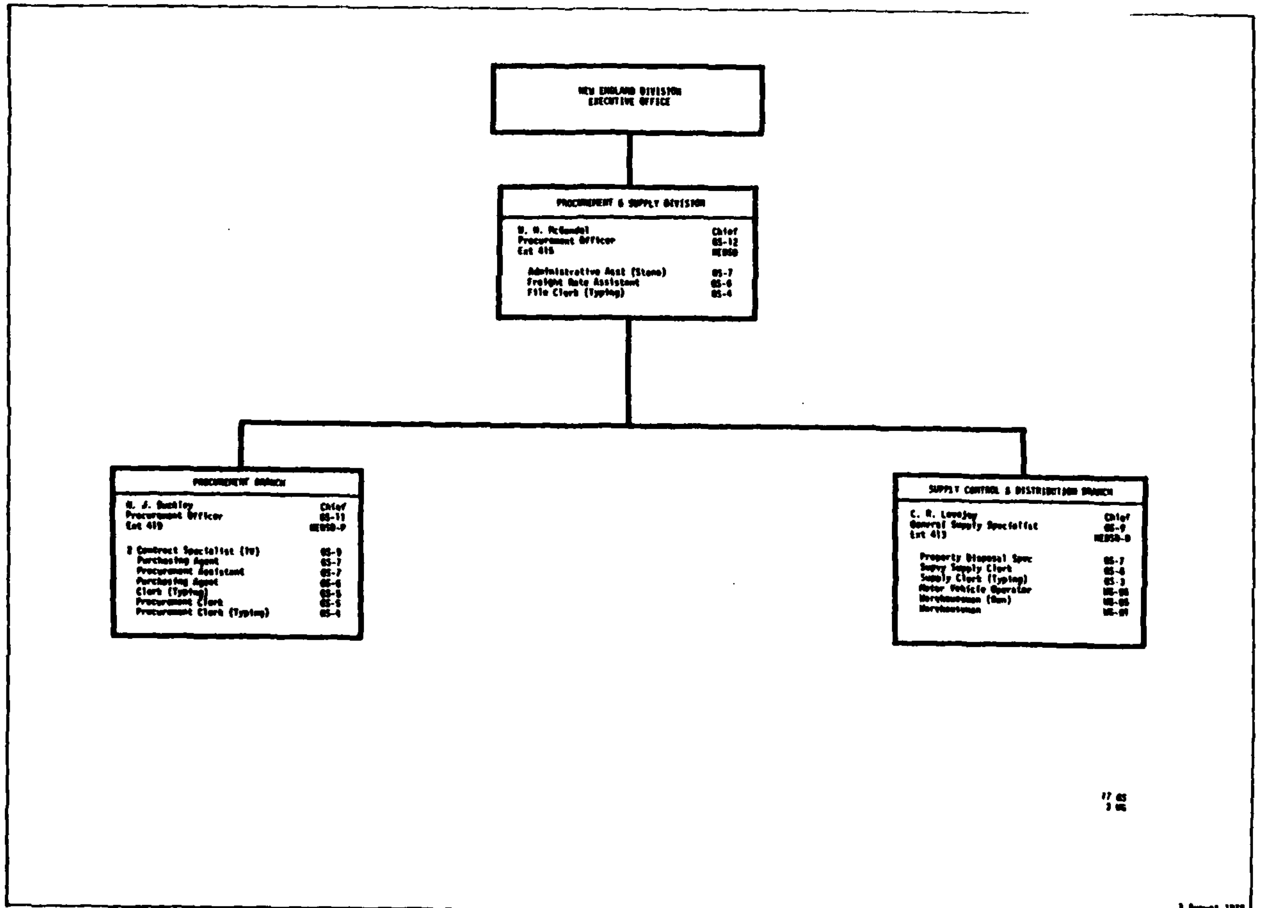
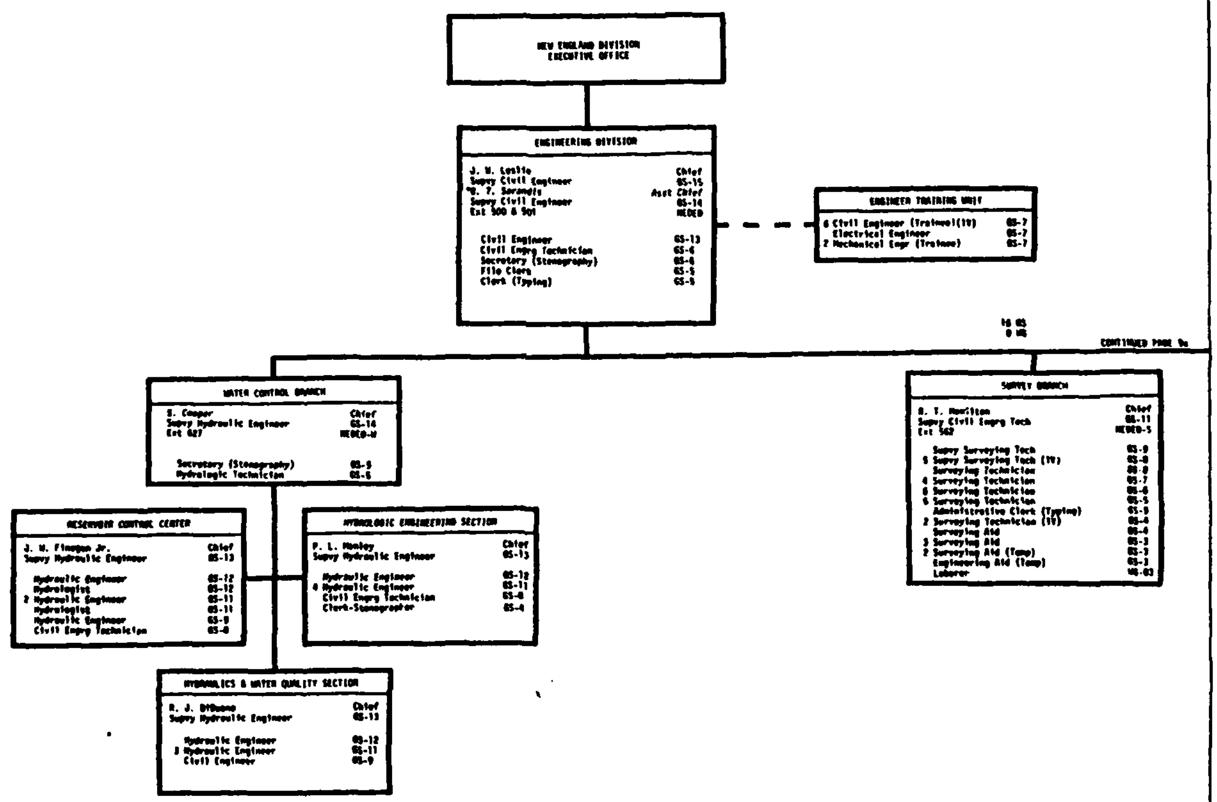
*Dual Assignment

1 August 1975



PROCUREMENT AND SUPPLY DIVISION

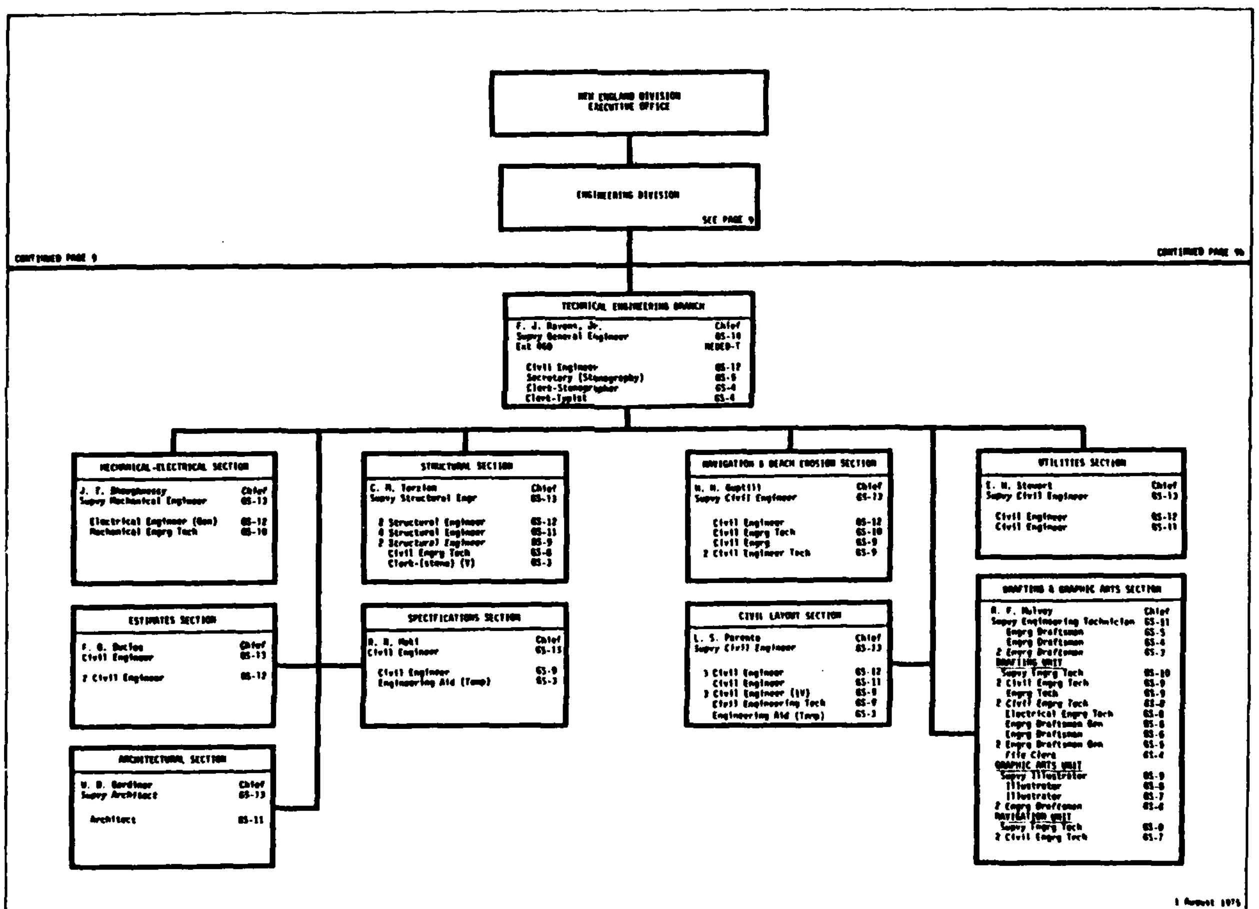
1 August 1975



*Dual Assignment - Chief, Project Management Branch

1 August 1979

ENGINEERING DIVISION: WATER CONTROL BRANCH - SURVEY BRANCH



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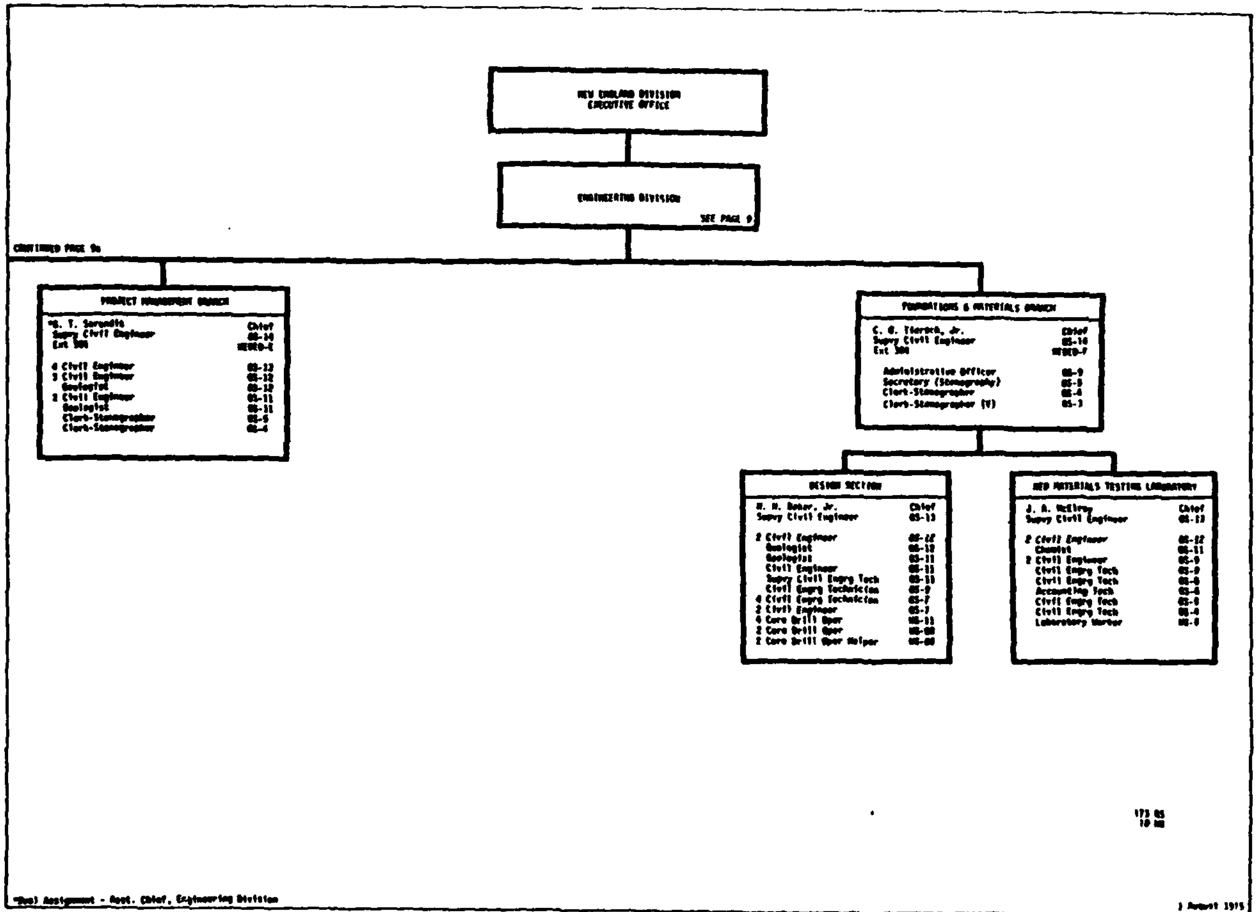
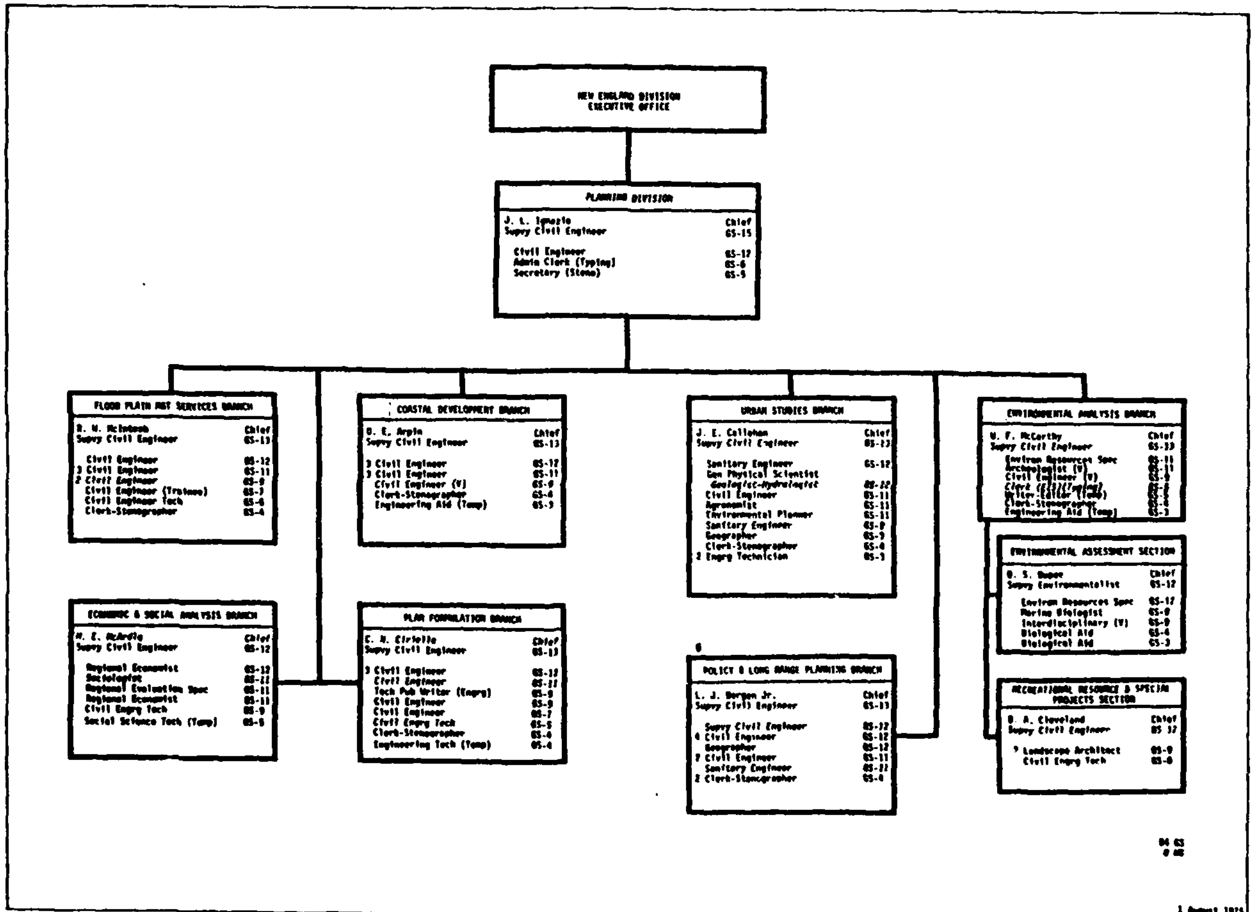
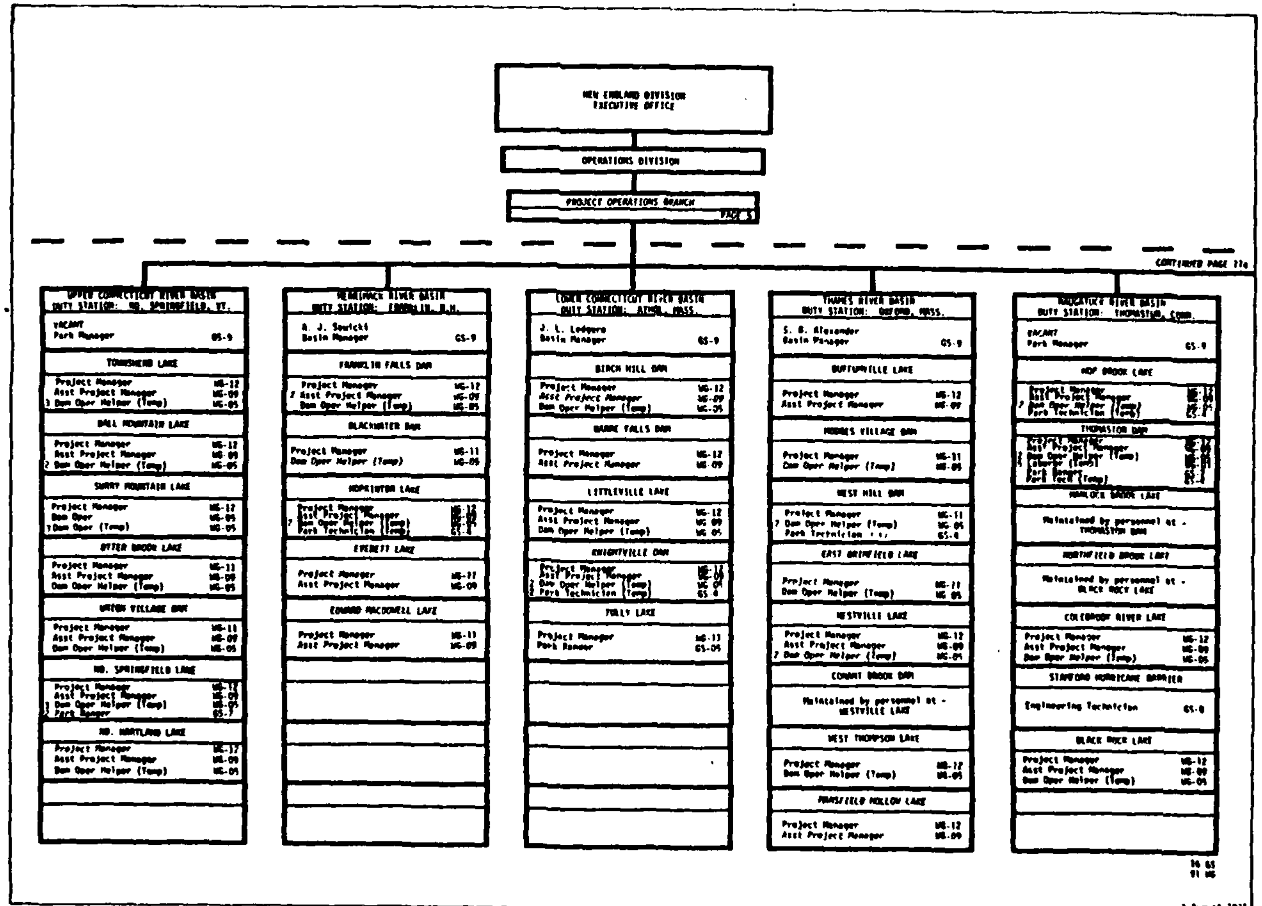


ENGINEERING DIVISION: PROJECT MANAGEMENT BRANCH - FOUNDATIONS & MATERIALS BRANCH

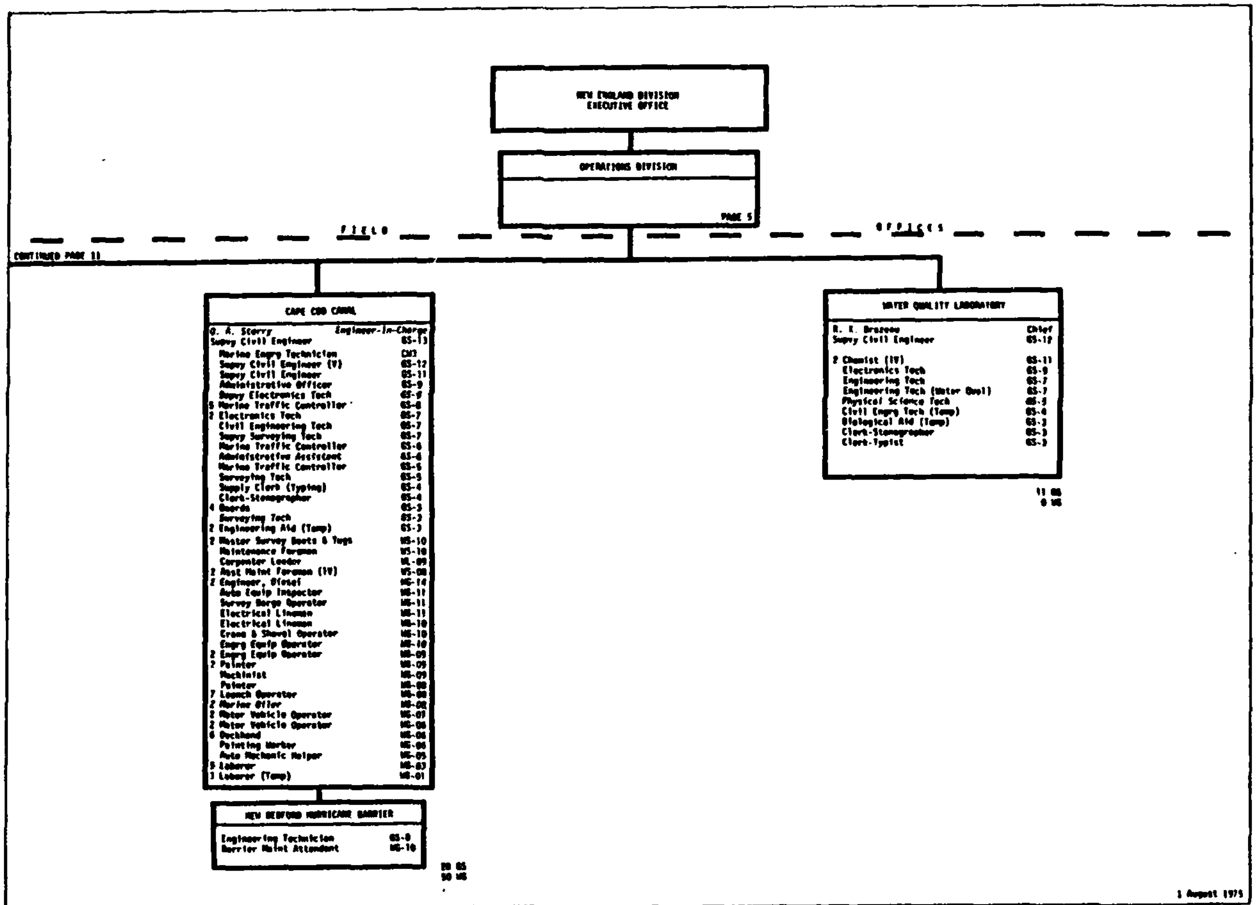


PLANNING DIVISION

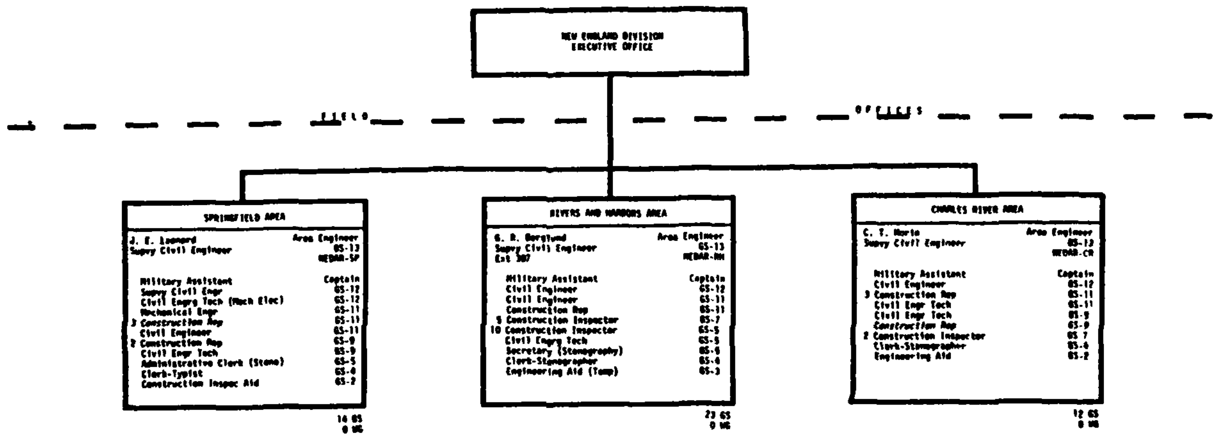
1 August 1975
PAGE 10



OPERATIONS DIVISION - COMPLETED DAMS & LAKES - COMPLETED HURRICANE BARRIERS



OPERATIONS DIVISION: CAPE COD CANAL - WATER QUALITY LABORATORY - COMPLETED HURRICANE BARRIERS



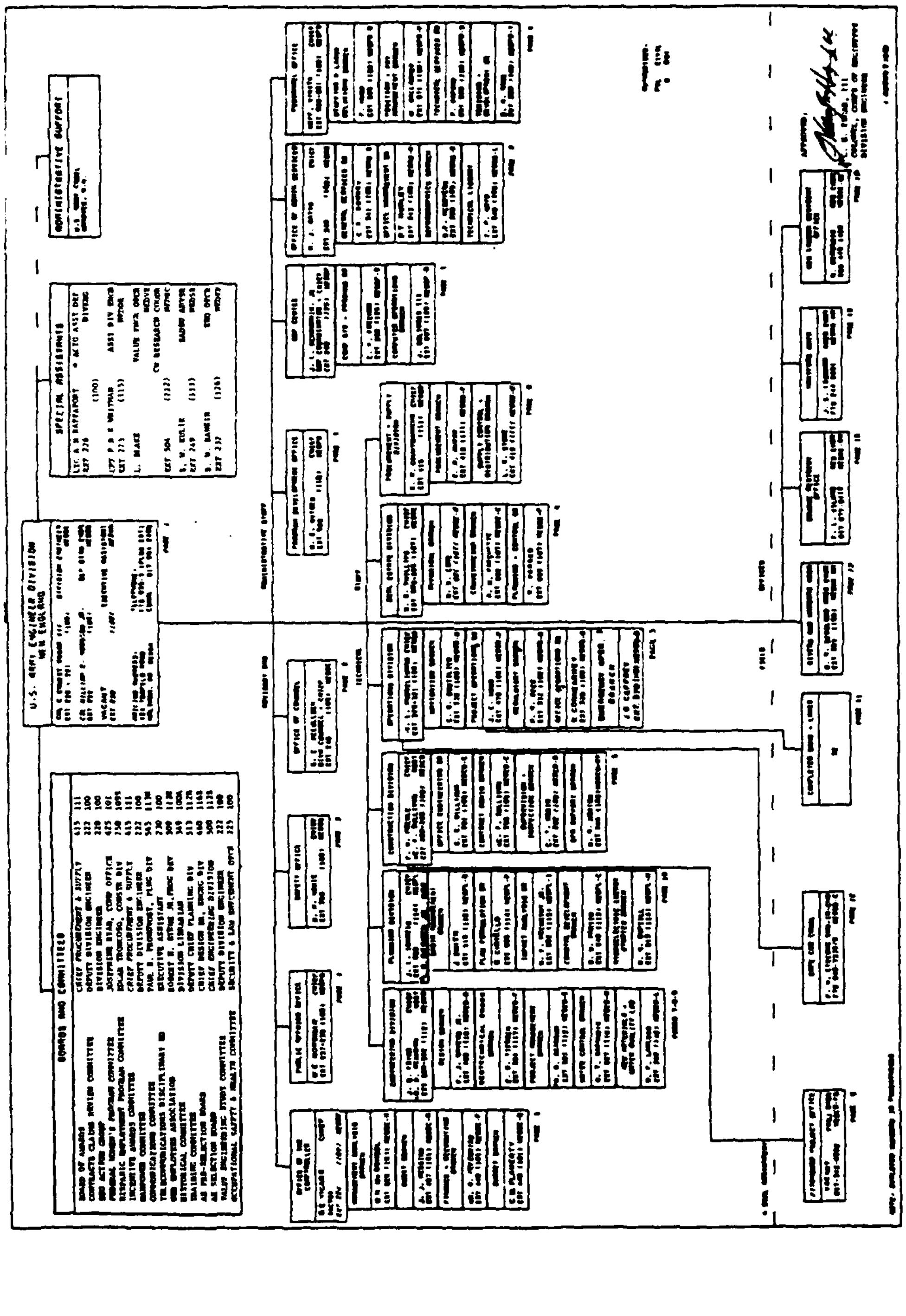
1 August 1975

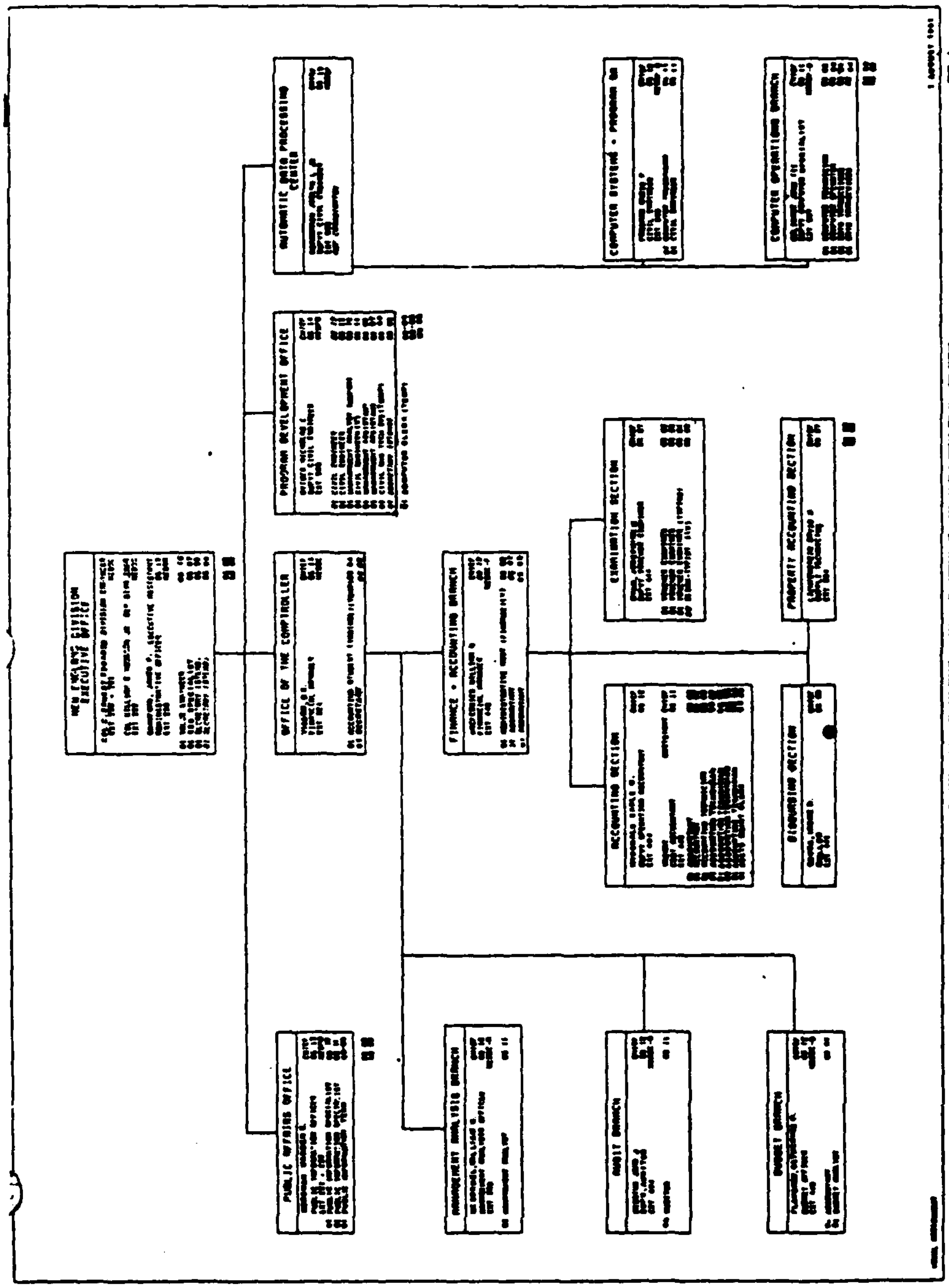
FIELD OFFICES: RIVERS & HARBORS AREA - SPRINGFIELD AREA - CHARLES RIVER AREA

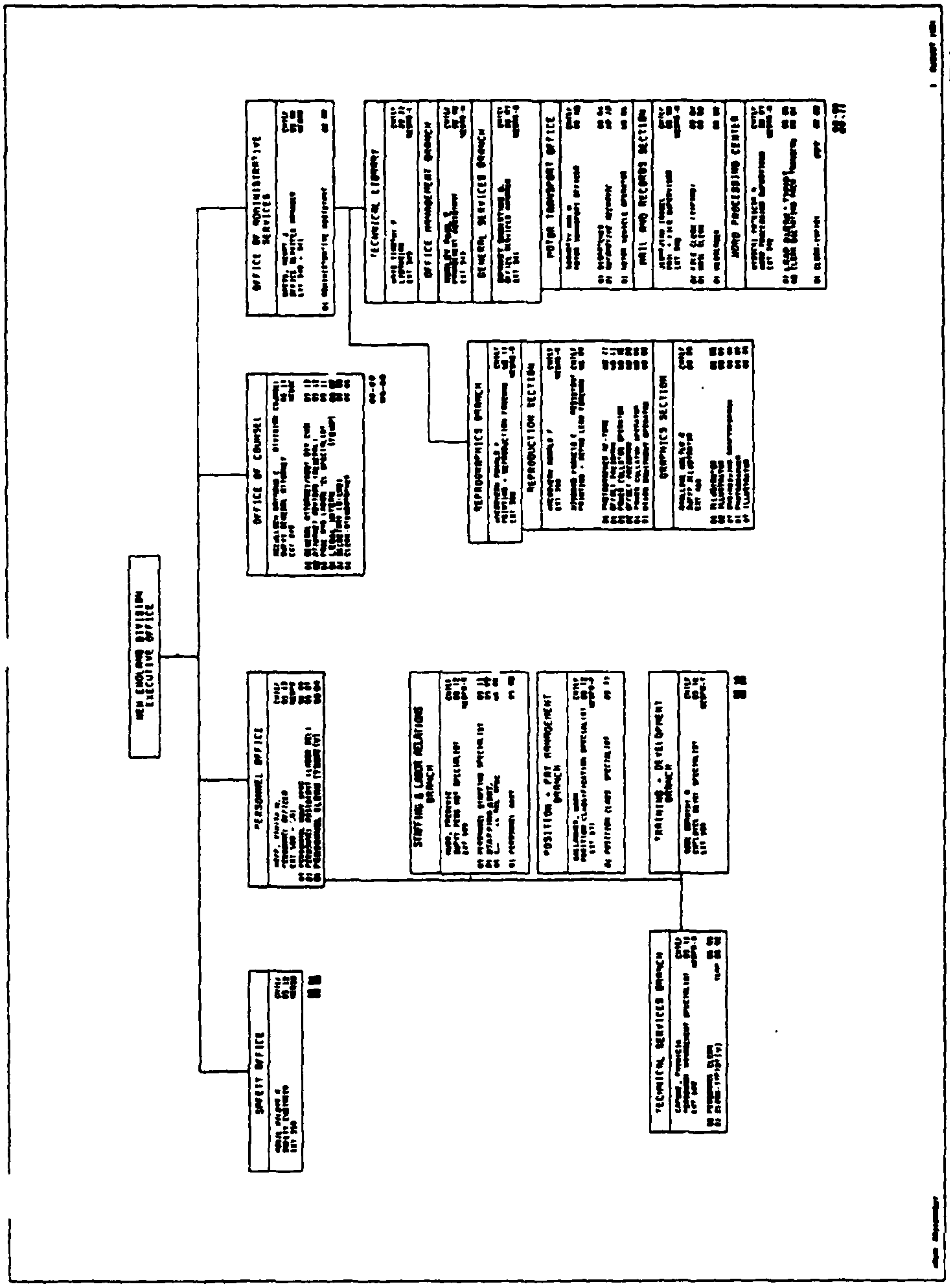
APPENDIX F

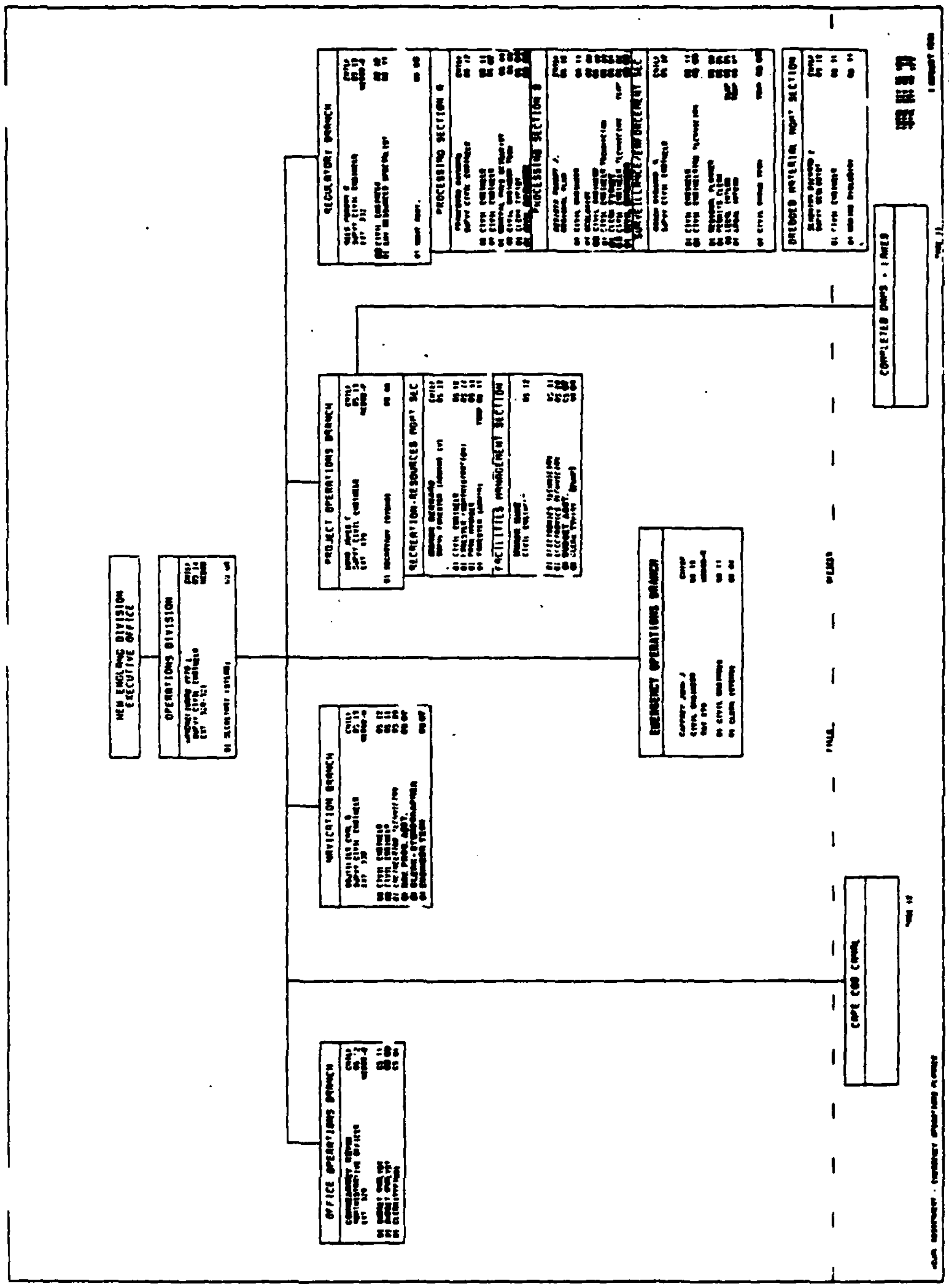
Organization Chart

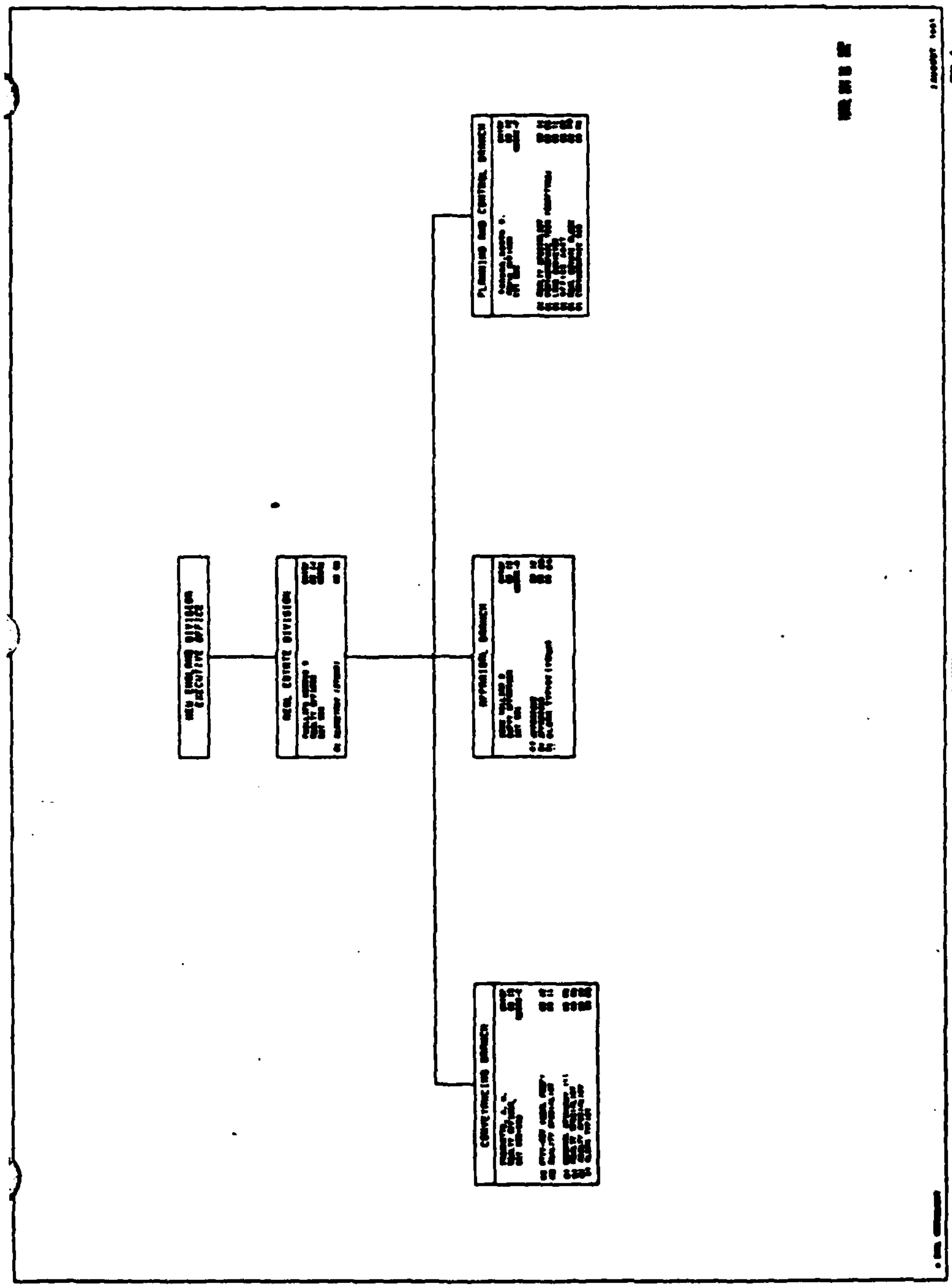
1 August 1981

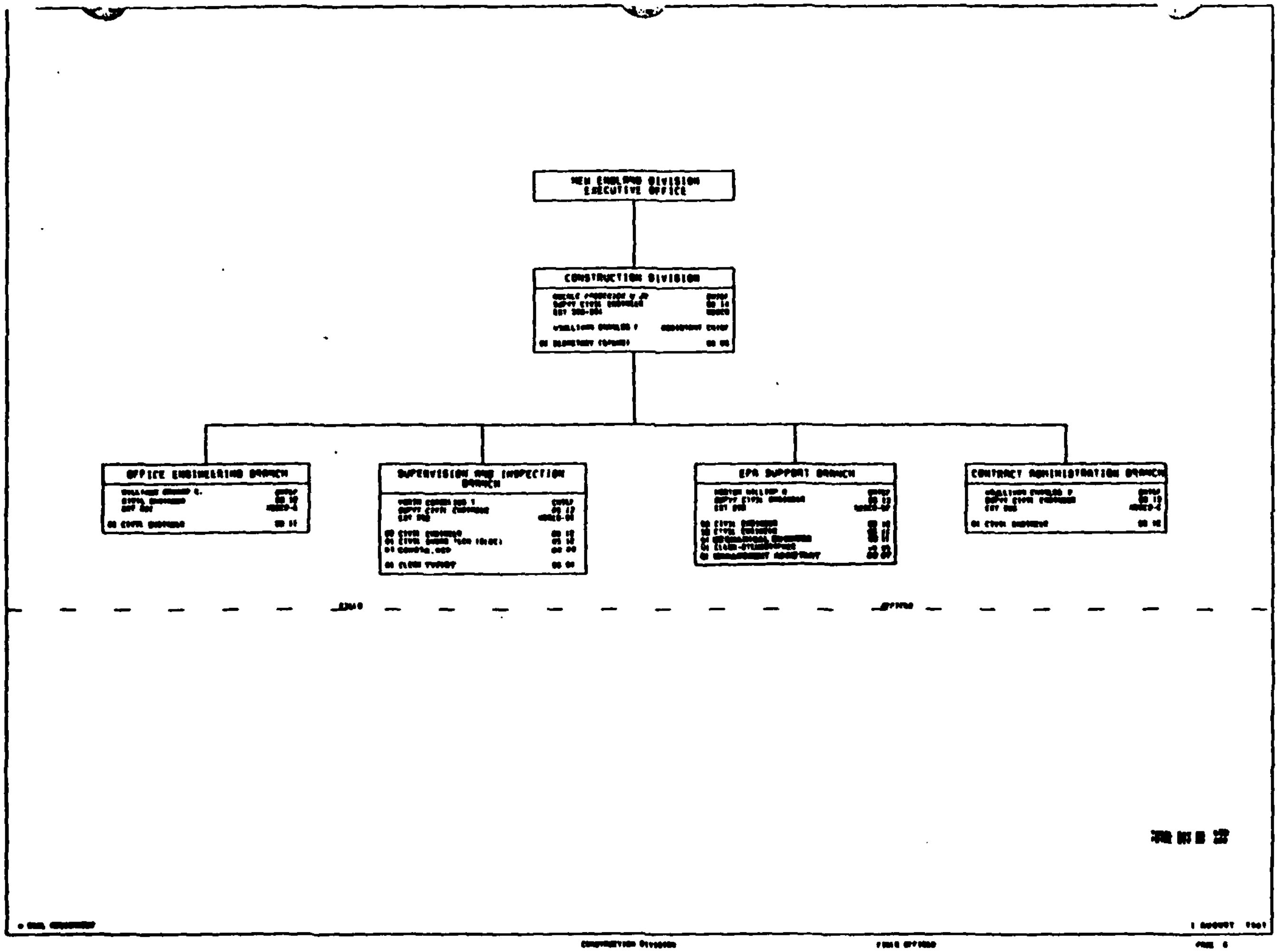

U.S. ARMY ENGINEER DIVISION NEW ENGLAND
BOARDS AND COMMITTEES
SPECIAL ASSISTANTS
ADMINISTRATIVE SUPPORT


NEW ENGLAND DIVISION EXECUTIVE OFFICE
OFFICE OF THE COMPTROLLER
PROGRAM DEVELOPMENT OFFICE
AUTOMATIC DATA PROCESSING CENTER
FINANCE + ACCOUNTING BRANCH
COMPUTER SYSTEMS + PROGRAM BR
COMPUTER OPERATIONS BRANCH
EXAMINATION SECTION
PROPERTY ACCOUNTING SECTION
ACCOUNTING SECTION
DISBURSING SECTION
PUBLIC AFFAIRS OFFICE
MANAGEMENT ANALYSIS BRANCH
AUDIT BRANCH
BUDGET BRANCH


NEW ENGLAND DIVISION
EXECUTIVE OFFICE
SAFETY OFFICE
PERSONNEL OFFICE
OFFICE OF COUNSEL
OFFICE OF ADMINISTRATIVE SERVICES
STAFFING & LABOR RELATIONS BRANCH
POSITION & PAY MANAGEMENT BRANCH
TRAINING & DEVELOPMENT BRANCH
TECHNICAL SERVICES BRANCH
REPROGRAPHICS BRANCH
REPRODUCTION SECTION
GRAPHICS SECTION
TECHNICAL LIBRARY
OFFICE MANAGEMENT BRANCH
GENERAL SERVICES BRANCH
MOTOR TRANSPORT OFFICE
MAIL AND RECORDS SECTION
WORD PROCESSING CENTER


NEW ENGLAND DIVISION EXECUTIVE OFFICE
OPERATIONS DIVISION
OFFICE OPERATIONS BRANCH
NAVIGATION BRANCH
EMERGENCY OPERATIONS BRANCH
PROJECT OPERATIONS BRANCH
RECREATION-RESOURCES MGMT SEC
FACILITIES MANAGEMENT SECTION
REGULATORY BRANCH
PROCESSING SECTION A
PROCESSING SECTION B
SURVEILLANCE/ENFORCEMENT SEC
DREDGED MATERIAL MGMT SECTION
COMPLETED DAMS - LAKES
CAPE COD CANAL




NEW ENGLAND DIVISION
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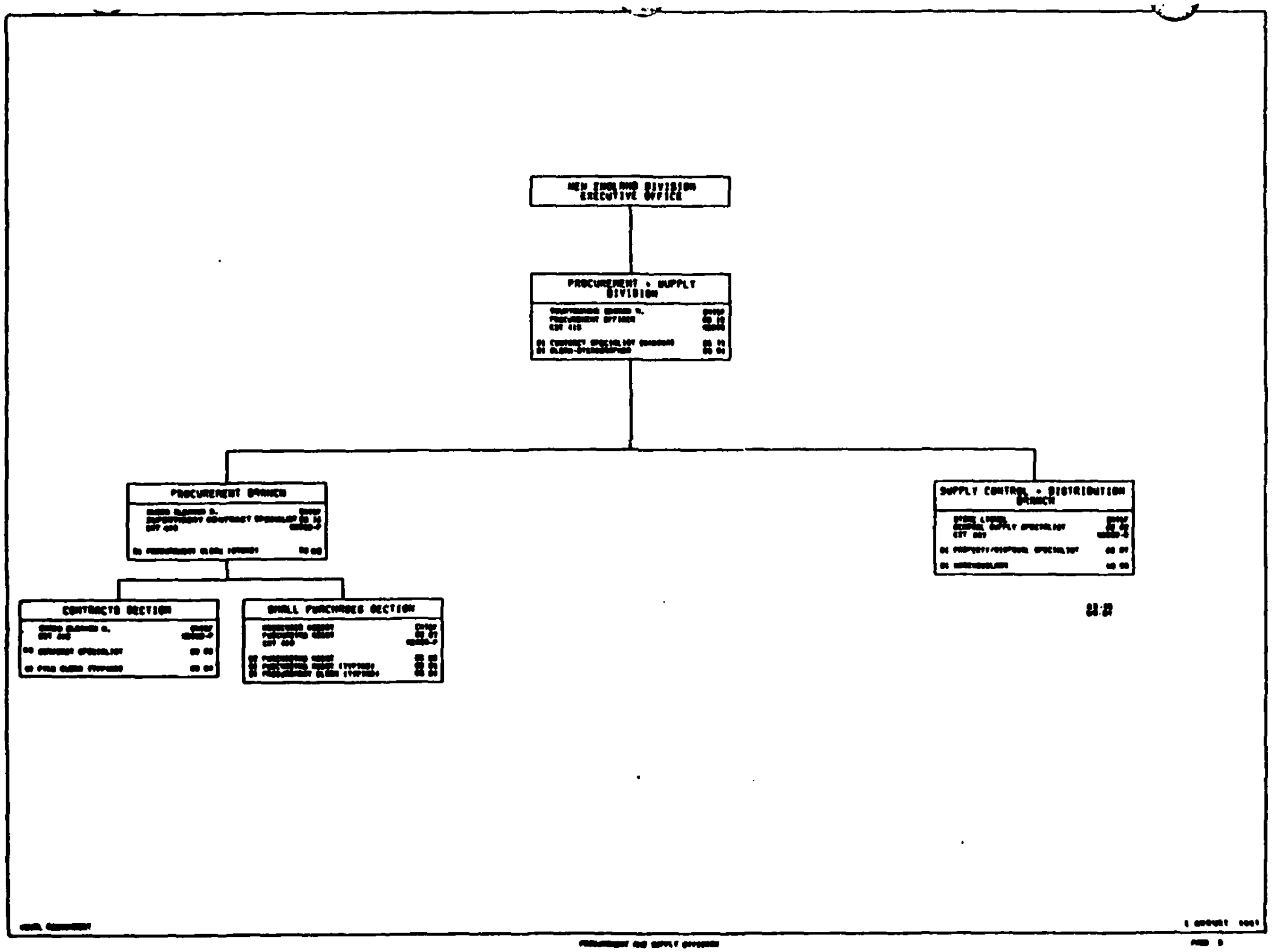
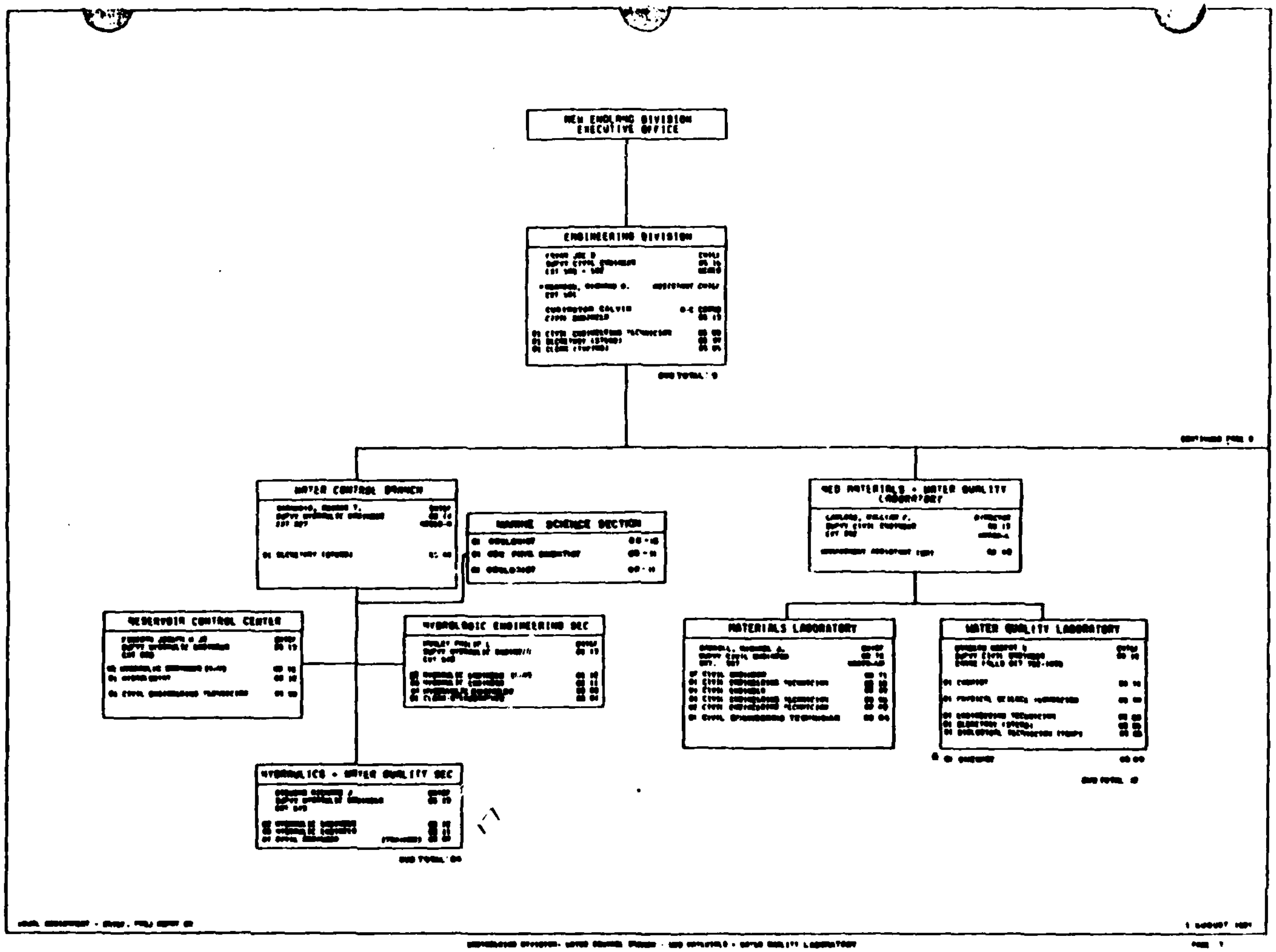
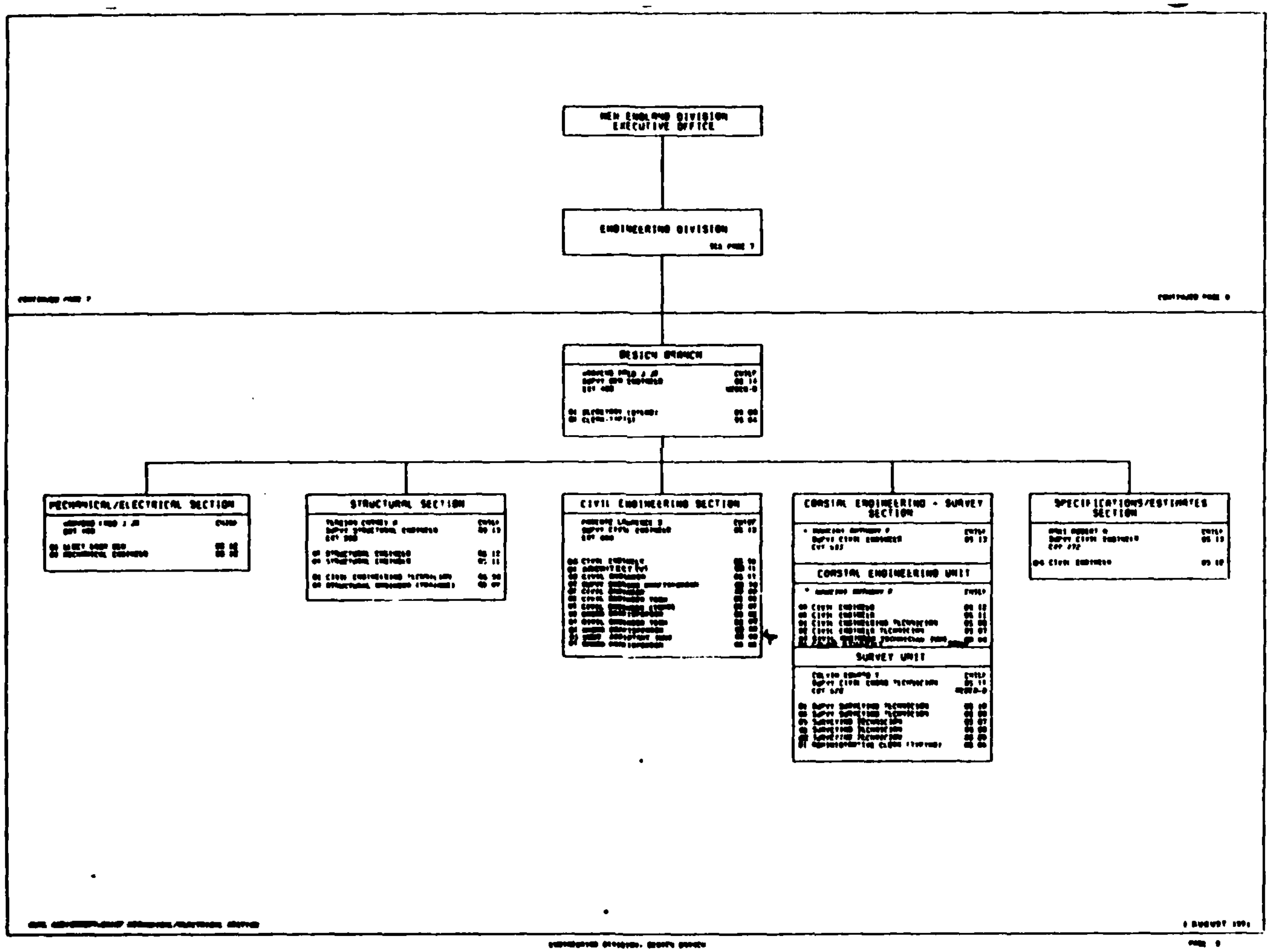
CONSTRUCTION DIVISION
OFFICE ENGINEERING BRANCH
SUPERVISION AND INSPECTION BRANCH
EPA SUPPORT BRANCH
CONTRACT ADMINISTRATION BRANCH


NEW ENGLAND DIVISION
EXECUTIVE OFFICE
PROCUREMENT & SUPPLY
DIVISION
PROCUREMENT BRANCH
SUPPLY CONTROL & DISTRIBUTION
BRANCH
CONTRACTS SECTION
SMALL PURCHASES SECTION


NEW ENGLAND DIVISION
EXECUTIVE OFFICE
ENGINEERING DIVISION
WATER CONTROL BRANCH
MARINE SCIENCE SECTION
RESERVOIR CONTROL CENTER
HYDROLOGIC ENGINEERING SEC
HYDRAULICS - WATER QUALITY SEC
NED MATERIALS - WATER QUALITY
LABORATORY
MATERIALS LABORATORY
WATER QUALITY LABORATORY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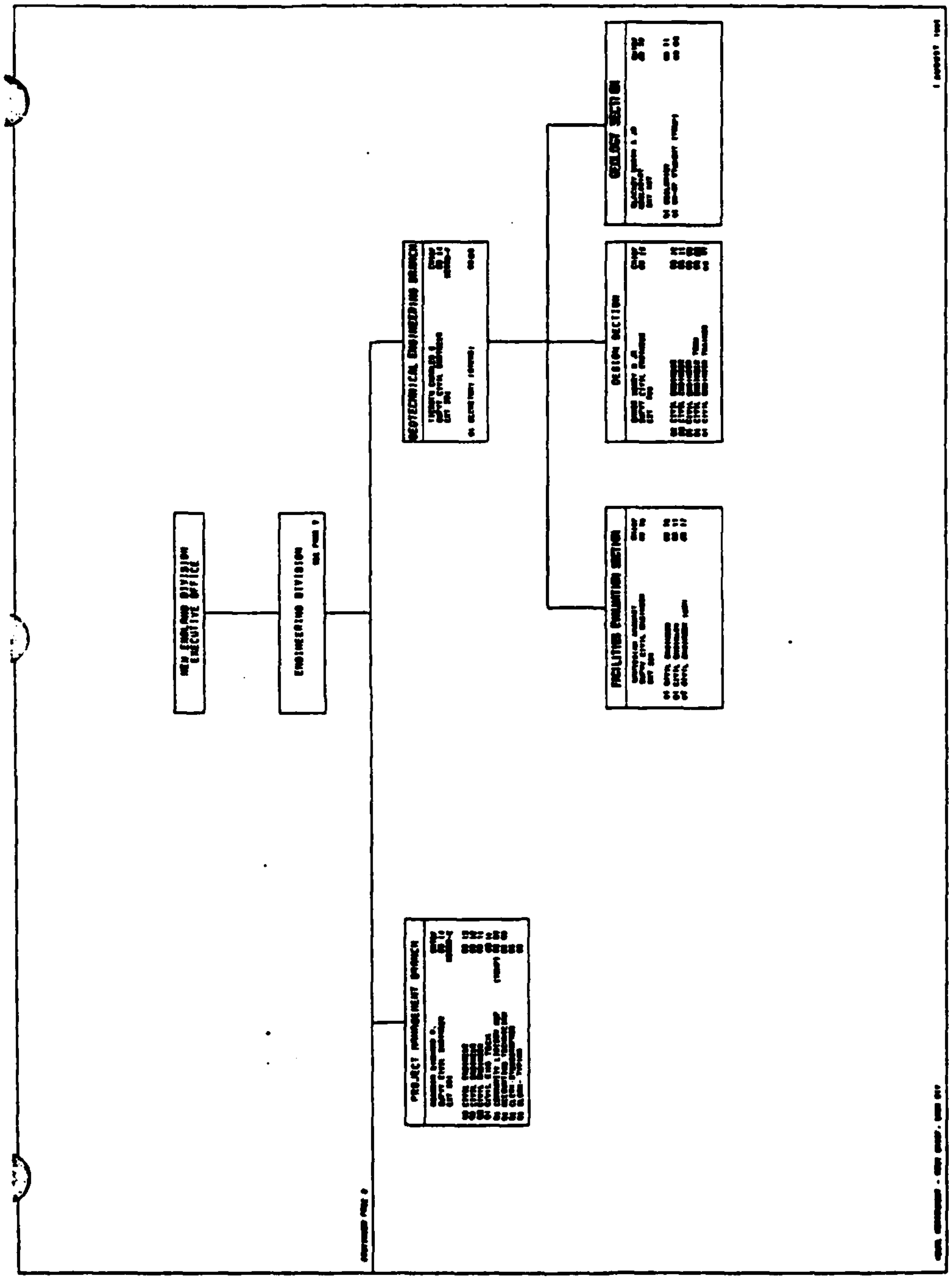
EXECUTIVE OFFICE
ENGINEERING DIVISION
DESIGN BRANCH
MECHANICAL/ELECTRICAL SECTION
STRUCTURAL SECTION
CIVIL ENGINEERING SECTION
COASTAL ENGINEERING - SURVEY SECTION
COASTAL ENGINEERING UNIT
SURVEY UNIT
SPECIFICATIONS/ESTIMATES SECTION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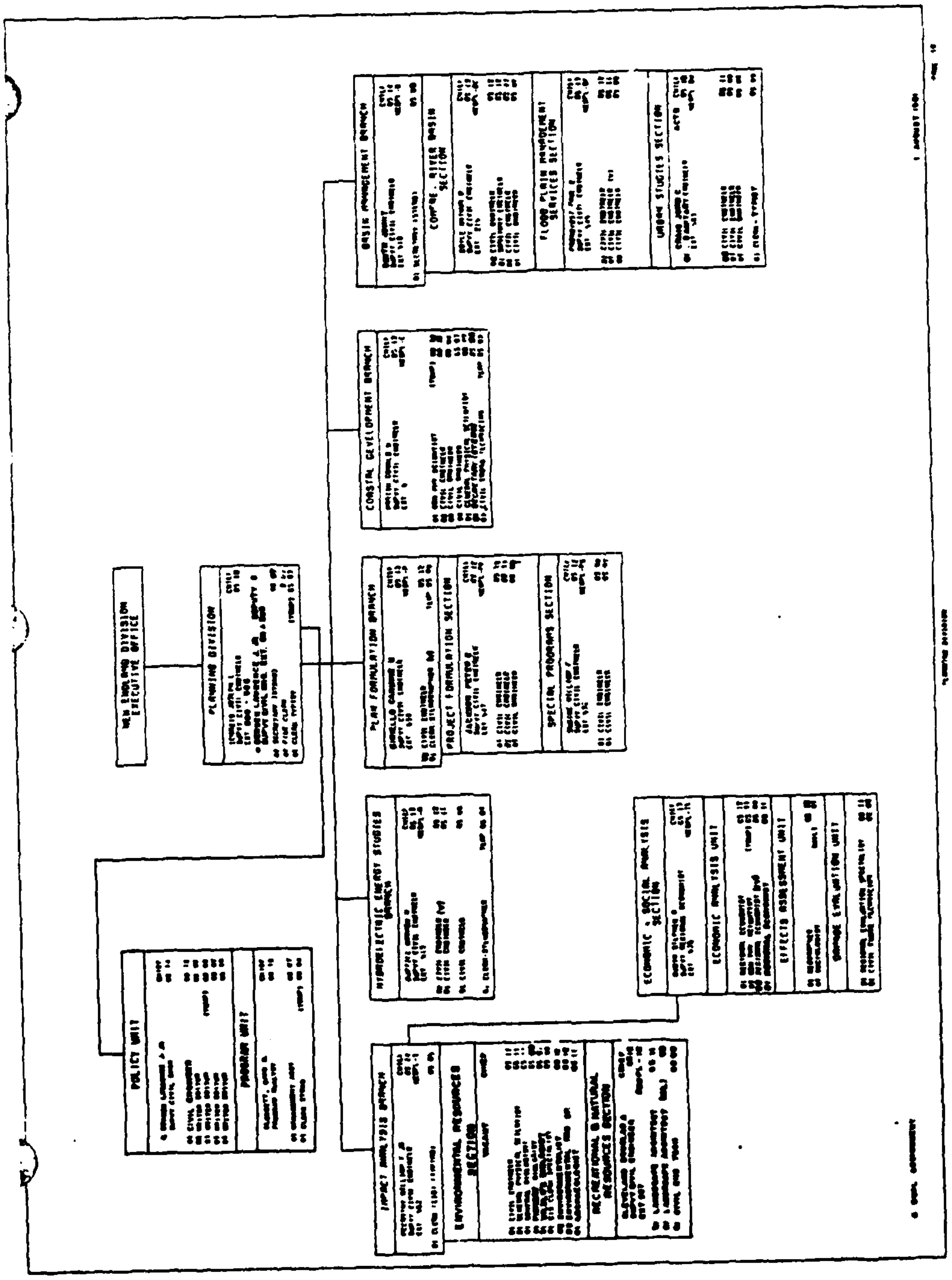
EXECUTIVE OFFICE
ENGINEERING DIVISION
PROJECT MANAGEMENT BRANCH
GEOTECHNICAL ENGINEERING BRANCH
FACILITIES EVALUATION SECTION
DESIGN SECTION
GEOLOGY SECTION

405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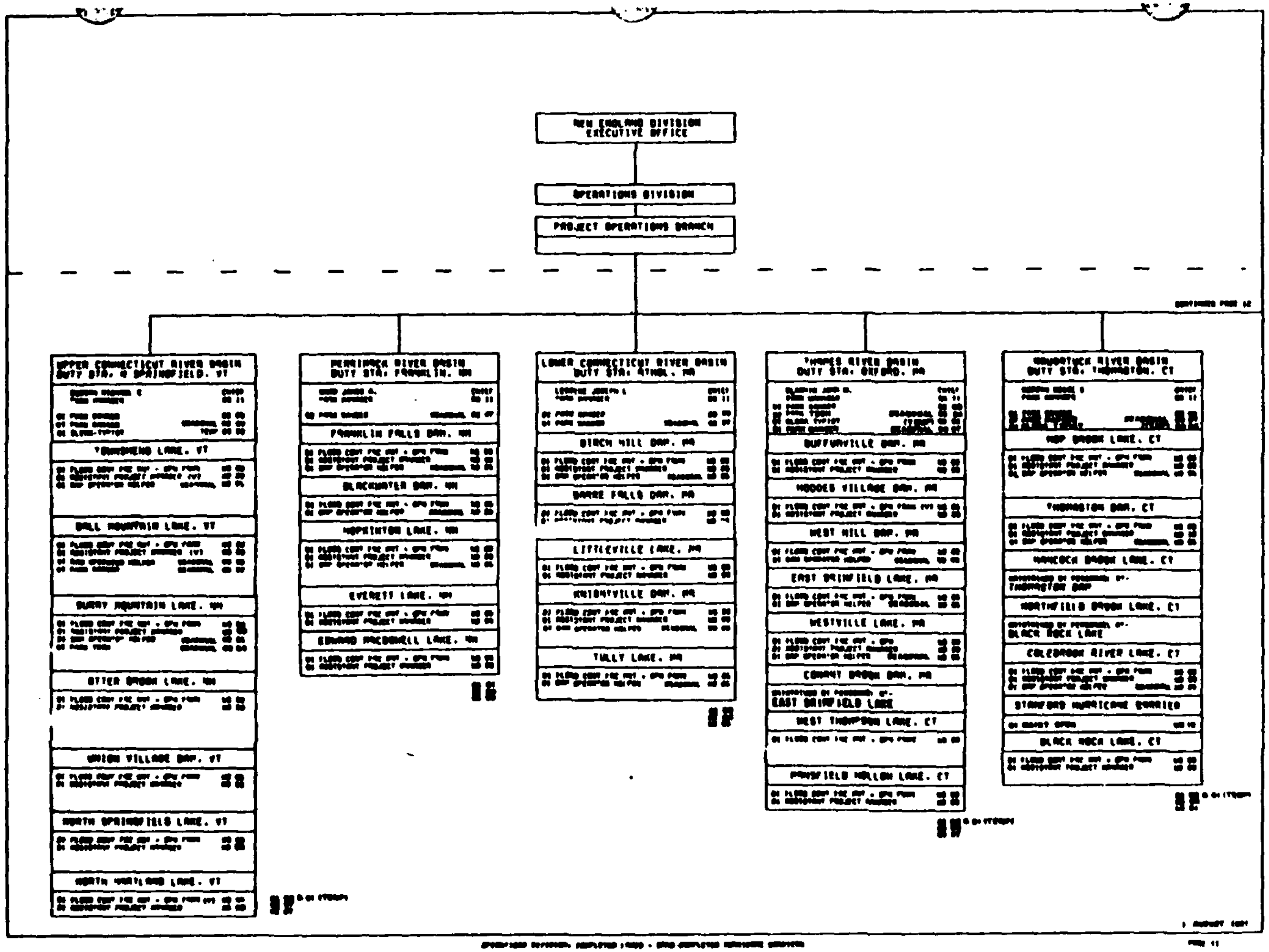
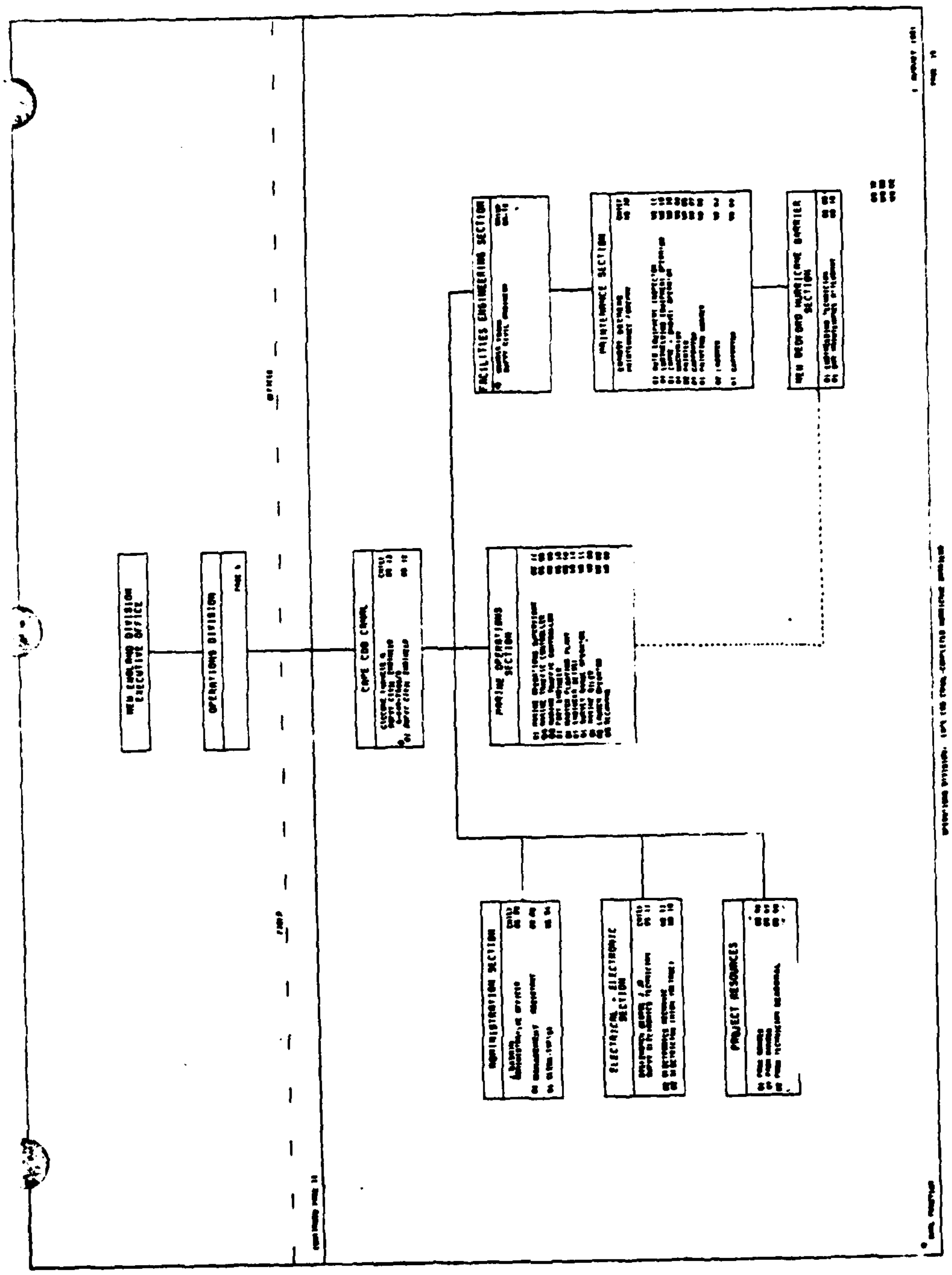
PLANNING DIVISION
POLICY UNIT
PROGRAM UNIT
BASIN MANAGEMENT BRANCH
COMPRE. RIVER BASIN SECTION
FLOOD PLAIN MANAGEMENT SERVICES SECTION
URBAN STUDIES SECTION
COASTAL DEVELOPMENT BRANCH
PLAN FORMULATION BRANCH
PROJECT FORMULATION SECTION
SPECIAL PROGRAMS SECTION
HYDROELECTRIC ENERGY STUDIES BRANCH
IMPACT ANALYSIS BRANCH
ENVIRONMENTAL RESOURCES SECTION
RECREATIONAL & NATURAL RESOURCES SECTION
ECONOMIC & SOCIAL ANALYSIS SECTION
ECONOMIC ANALYSIS UNIT
EFFECTS ASSESSMENT UNIT
DAMAGE EVALUATION UNIT



NEW ENGLAND DIVISION EXECUTIVE OFFICE
OPERATIONS DIVISION
PROJECT OPERATIONS BRANCH
UPPER CONNECTICUT RIVER BASIN DUTY STA. N SPRINGFIELD, VT
TOWNSHEND LAKE, VT
BALL MOUNTAIN LAKE, VT
SURRY MOUNTAIN LAKE, NH
OTTER BROOK LAKE, NH
UNION VILLAGE DAM, VT
NORTH SPRINGFIELD LAKE, VT
NORTH HARTLAND LAKE, VT
MERRIMACK RIVER BASIN DUTY STA. FRANKLIN, NH
FRANKLIN FALLS DAM, NH
BLACKWATER DAM, NH
HOPKINTON LAKE, NH
EVERETT LAKE, NH
EDWARD MACDOWELL LAKE, NH
LOWER CONNECTICUT RIVER BASIN DUTY STA. ATHOL, MA
BIRCH HILL DAM, MA
BARRE FALLS DAM, MA
LITTLEVILLE LAKE, MA
KNIGHTVILLE DAM, MA
TULLY LAKE, MA
THAMES RIVER BASIN DUTY STA. OXFORD, MA
BUFFUMVILLE DAM, MA
HODGES VILLAGE DAM, MA
WEST HILL DAM, MA
EAST BRIMFIELD LAKE, MA
WESTVILLE LAKE, MA
CONANT BROOK DAM, MA
EAST BRIMFIELD LAKE
WEST THOMPSON LAKE, CT
MANSFIELD HOLLOW LAKE, CT
NAUGATUCK RIVER BASIN DUTY STA. THOMASTON, CT
HOP BROOK LAKE, CT
THOMASTON DAM, CT
HANCOCK BROOK LAKE, CT
THOMASTON DAM
NORTHFIELD BROOK LAKE, CT
BLACK ROCK LAKE
COLEBROOK RIVER LAKE, CT
STAMFORD HURRICANE BARRIER
BLACK ROCK LAKE, CT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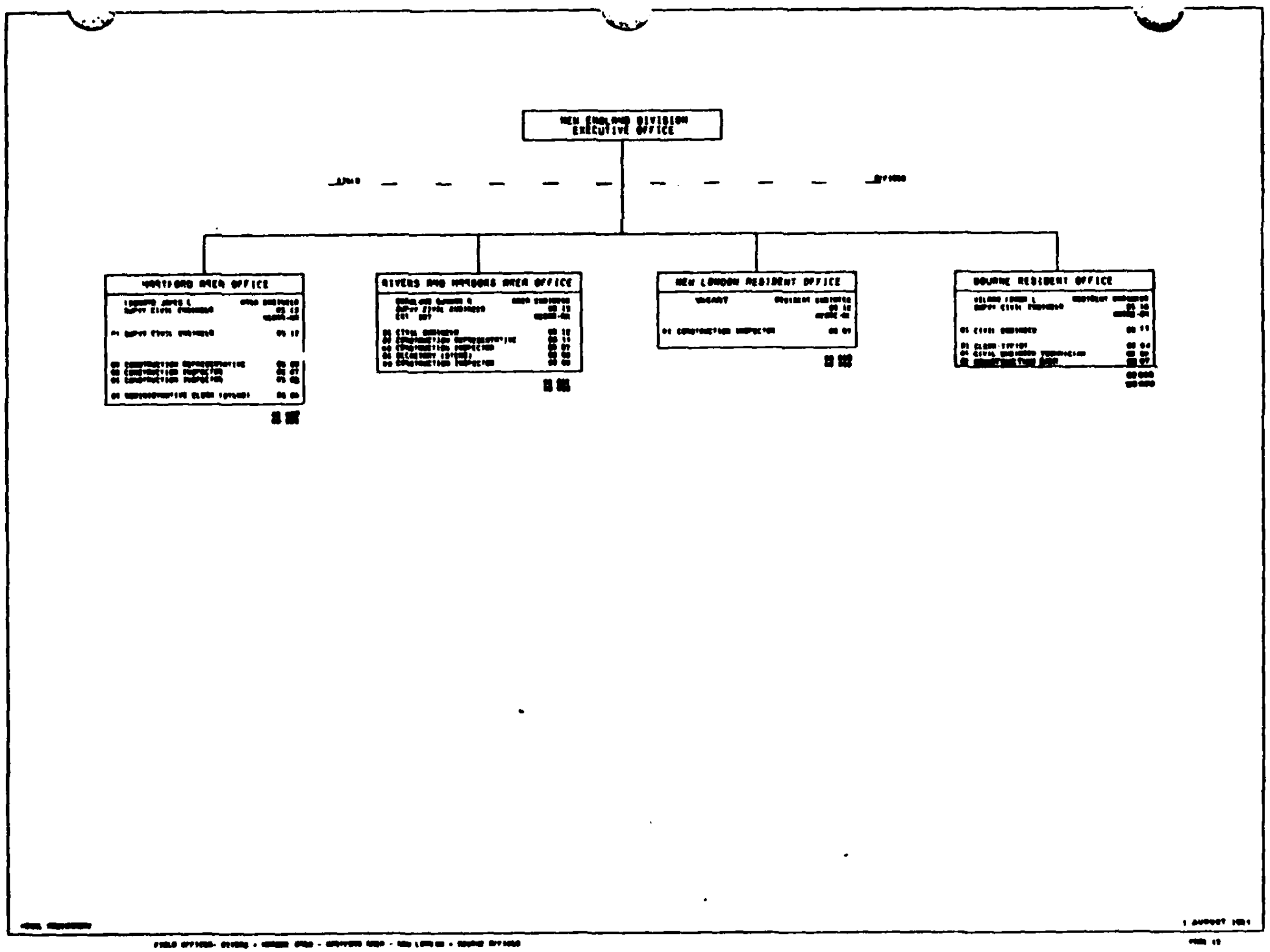
OPERATIONS DIVISION
CAPE COD CANAL
MARINE OPERATIONS SECTION
FACILITIES ENGINEERING SECTION
MAINTENANCE SECTION
NEW BEDFORD HURRICANE BARRIER SECTION
ADMINISTRATION SECTION
ELECTRICAL - ELECTRONIC SECTION
PROJECT RESOURCES


NEW ENGLAND DIVISION
EXECUTIVE OFFICE
HARTFORD AREA OFFICE
RIVERS AND HARBORS AREA OFFICE
NEW LONDON RESIDENT OFFICE
BOURNE RESIDENT OFFICE

BIBLIOGRAPHY

A. General References.

1. Bagozzi, Richard P. and Lynn W. Phillips, "Representing and Testing Organizational Theories: A Holistic Construal", Administrative Science Quarterly, Volume 27, 1982, pp. 459-489.

2. Barreda, Salvador Miranda, Changes in Railroad Organizations For Major Improvement Programs, MIT Masters Thesis, Sept. 1982, 172p.

3. Beer, Michael, Organization Change and Development A Systems View, Goodyear Publishing Company Inc., Santa Monica, California, 1980.

4. Beyer, Janice M. and Harrison M. Trice, "A Reexamination of the Relations Between Size and Various Components of Organizational Complexity", Administrative Science Quarterly, Volume 24, March 1979, pp. 48-64.

5. Blackburn, Richard S., "Multidimensional Scaling and the Organizational Sciences", Journal of Management, Volume 8, No. 1, 1982, pp. 95-103.

6. Blau, Peter M., "Comments on Two Mathematical Formulations of the Theory of Differentiation in Organizations", American Sociological Review, Volume 36, April 1971, pp. 304-307.

7. Blau, Peter M. and Richard A. Schoenherr, The Structure of Organizations, Basic Books Inc., New York, NY, 1971.

8. Child, John, "Organization Structure and Strategies of Control: A Replication of the Aston Group Study", Administrative Science Quarterly, Volume 17, 1972a, pp. 163-177.

9. Corlett, E. N. and A. T. Parsons, "Measurement of Changes: What Criteria Do We Adopt?" Omega, Volume 6, No. 5, 1978, pp. 399-406.

10. Crozier, Michel, The Bureaucratic Phenomenon, The University of Chicago Press, Chicago, Ill., 1964.

11. Dalton, Gene W., Paul R. Lawrence and Jay W. Lorsch, Organizational Structure and Design, Irwin-Dorsey

Limited, Georgetown, Ontario, 1970.

12. Dewar, Robert and Jerald Hage, "Size, Technology, Complexity, and Structural Differentiation: Toward A Theoretical Synthesis", Administrative Science Quarterly, Volume 23, March 1978, pp. 111-136.

13. Digest of Water Resources Policies and Authorities, Policy Digest-81, US Army Corps of Engineers, Office of the Chief of Engineers, EP 1165-2-1, March 1981.

14. Eddy, William B., Public Organization Behavior and Development, Winthrop Publishers Inc., Cambridge, Mass., 1981.

15. Evans, Martin G. and Will McQuillan, " A Longitudinal Analysis of the Context and Structure of a Large British Financial Institution", Journal of Management Studies, Volume 14, May 1979, pp. 131-146.

16. Ford, Jeffrey D., "The Administrative Component in Growing and Declining Organizations: A Longitudinal Analysis", Academy of Management Journal, Volume 23, No. 4, 1980, pp. 615-630.

17. Golembiewski, Robert T. and William B. Eddy eds., Organization Development in Public Administration, 2 parts, Marcel Dekkar Inc., New York, NY, 1978.

18. Grinyer, Peter H. and Masoud Yasai-Ardekani, "Dimensions of Organizational Structure", Academy of Management Journal, Volume 23, No. 2, 1980, pp. 405-421.

19. Hall, Roger I., "A System Pathology of an Organization: The Rise and Fall of the Old Saturday Evening Post", Administrative Science Quarterly, Volume 21, June 1976, pp. 185-211.

20. Hickson, David J., D. S. Pugh and Diana C. Physey, "Operations Technology and Organizational Structure: An Empirical Reappraisal", Administrative Science Quarterly, Volume 14, Sept. 1969, pp. 378-397.

21. Hummon, Norman P., "A Mathematical Theory of Differentiation in Organizations", American Sociological Review, Volume 36, April 1971, pp. 297-303.

22. Irwig, Henry, "Reorganization in Departments of Public Works", MIT Research Paper, June 1983.

23. Ito, Jack K. and Kalburge M. Srinivas, "The Use of Impact and Self-Impact Correlation In Causal Analysis", Academy of Management Review, Volume 6, No. 2, 1981, pp. 301-308.

24. Ivancevich, John M. and Michael J. Matteson, "Longitudinal Organizational Research in Field Settings", Journal of Business Research, Volume 6, No. 3, August 1978, pp. 181-201.

25. Kaufman, Herbert, The Limits of Organizational Change, The University of Alabama Press, Alabama, 1971.

26. Kimberly, John R., "Organizational Size and the Structuralist Perspective: A Review, Critique, and Proposal", Administrative Science Quarterly, Volume 21, December 1976, pp. 571-597.

27. Lawrence, Paul R. and Jay W. Lorsch, Organizations, Addison-Wesley Publishing Company, Reading, Mass., 1969.

28. Lawrence, Paul R. and Jay W. Lorsch, Organization and Environment, Managing Differentiation and Integration, Division of Research Graduate School of Business Administration, Harvard University, Cambridge, Mass., 1967.

29. Lawrence, Paul R. and Jay W. Lorsch, Studies In Organization Design, Irwin-Dorsey Limited, Georgetown, Ontario, 1970.

30. Mansfield, Roger, "Bureaucracy and Centralization: An Examination of Organizational Structure", Administrative Science Quarterly, Volume 18, Sept. 1973, pp. 477-488.

31. Mayhew, Bruce H., Roger L. Levinger, J. Miller McPherson and Thomas F. James, "System Size and Structural Differentiation in Formal Organizations: A Baseline Generator For Two Major Theoretical Propositions", American Sociological Review, Volume 37, 1972, pp. 629-633.

32. Mazmanian, Daniel A. and Jeanne Nienaber, Can Organizations Change? The Brookings Institute, Washington DC, 1979.

33. Meyer, Marshall W., Change In Public Bureaucracies, Cambridge University Press, New York, NY, 1979.

34. Meyer, Marshall W., "Size and the Structure of Organizations: A Causal Analysis", American Sociological Review, Volume 37, 1972, pp. 434-440.

35. Meyer, Marshall W., "Some Constraints in Analyzing Data on Organizational Structures: A Comment on Blau's Paper", American Sociological Review, Volume 36, April 1971, pp. 294-296.

36. Miles, Raymond E. and Charles C. Snow, Organizational Strategy, Structure, and Process, McGraw-Hill Book Company, New York, NY, 1978.

37. Miller, Danny and Peter H. Friesen, "The Longitudinal Analysis of Organizations: A Methodological Perspective," Management Science, Volume 28, No. 9, Sept. 1982, pp. 1013-1034.

38. Miller, Danny, "The Role of Multivariate 'Q-Techniques' in the Study of Organizations", Academy of Management Review, Volume 3, 1978, pp. 515-531.

39. Miller, Danny, "Toward A New Contingency Approach: The Search For Organizational Gestalts", Journal of Management Studies, Volume 18, January 1981, pp. 1-25.

40. Mintzberg, Henry and James A. Waters, "Tracking Strategy in an Entrepreneurial Firm", Academy of Management Journal, Volume 25, 1982, pp. 465-499.

41. Mintzberg, Henry, Structure in Fives Designing Effective Organizations, Prentice-Hall Inc., Englewood Cliffs, NJ, 1983.

42. Mintzberg, Henry, The Structuring of Organizations, Prentice-Hall Inc., Englewood, Calf., 1979.

43. Parkman, Aubrey, Army Engineers in New England, US Army Corps of Engineers New England Division, Waltham, Mass., 1978.

44. Patterson, T. T., Management Theory, Business Publications Limited, London, UK, 1967.

45. Pennings, Johannes, "Measures of Organizational Structure: A Methodological Note", American Journal of Sociology, Volume 79, No. 3, 1973, pp. 686-704.

46. Perrow, Charles, "A Framework For The Comparative Analysis of Organizations", American Sociological

Review, Volume 32, 1967, pp. 194-208.

47. Pugh, D. S., D. J. Hickson and C. R. Hinings, "An Empirical Taxonomy of Structures of Work Organizations", Administrative Science Quarterly, Volume 14, March 1969, pp. 115-125.

48. Pugh, D. S., D. J. Hickson, C. R. Hinings and C. Turner, "Dimensions of Organization Structure", Administrative Science Quarterly, Volume 13, No. 1, March 1968, pp. 65-105.

49. Riemann, Bernard C., "On The Dimensions of Bureaucratic Structure: An Empirical Reappraisal", Administrative Science Quarterly, Volume 18, Sept. 1973, pp. 462-476.

50. Reinhardt, William Shepler, The Role of Organizational Strategy in Developing C.B.I.S. For Construction Firms, MIT Masters Thesis, February 1983, 149p.

51. Snyder, Neil H. and William F. Glueck, "Can Environmental Volatility Be Measured Objectively?", Academy of Management Journal, Volume 25, No. 1, 1982, pp. 185-192.

52. Stinchcombe, Arthur L., "Bureaucratic and Craft Administration of Production: A Comparative Study", Administrative Science Quarterly, Volume 4, 1959, pp. 168-187.

53. Thompson, James D., Organizations In Action, McGraw-Hill Book Company, New York, NY, 1967.

54. Tushman, Michael, Organizational Change: An Exploratory Study and Case History, Publications Division New York State School of Industrial and Labor Relations Cornell University, Ithaca, NY, 1974.

55. Walton, Eric J., "The Comparison of Measures of Organization Structure", Academy of Management Review, Volume 6, January 1981, pp. 155-160.

56. Whetten, David A., "Organizational Decline: A Neglected Topic in Organizational Science", Academy of Management Review, Volume 5, No. 4, October 1980, pp. 577-588.

B. References From NED Completed Project Files/Records.

57. Ansonia-Derby Local Protection Project, Connecticut, 1955-1974.

58. Charles River Dam, Massachusetts, 1968-1979.

59. Danbury Local Protection Project, Connecticut, 1967-1979.

60. Derby Local Protection Project, Connecticut, 1961-1973.

61. Gardner Local Protection Project, Massachusetts, 1961-1966.

62. Hartland Dam, Maine, 1981-1984.

63. Hopkinton-Everett Reservoir, New Hampshire, 1955-1963.

64. Islesborro Navigation Project, Maine, 1981-1984.

65. Littleville Dam/Reservoir, Massachusetts, 1955-1966.

66. Lower Woonsocket Local Protection Project, Rhode Island, 1961-1967.

68. New London Hurricane Protection Project, Connecticut, 1958-1984.

69. Otter Brook Dam/Reservoir, New Hampshire, 1955-1959.

70. Saxonville Local Protection Project, Massachusetts, 1963-1980.

71. Smelt Brook Local Protection Project Massachusetts, 1969-1975.

72. Three River Local Protection Project, Massachusetts, 1961-1967.

C. References From NED Financial and Historical records.

73. Annual End of Fiscal Year Financial Records available through the Programs Office and the Office of the Comptroller, FY 1956 through FY 1983.

74. Semi-Annualy Published Organizational Charts of NED available through the Management Analysis Branch, Office of the Comptroller, 1955-1983.

75. Statement of Cost, Office of the Chief of Engineers, US Corps of Engineers, FY 1955 through FY 1979.

D. NED Personnel Interviewed.

76. Beaudoin, Maurice, Supervision and Inspection Branch, Construction Division.

77. Carlson, Richard C., Chief of Construction Division.

78. Doyle, A., Chief of Comprehensive River Basin Planning Section, Basin Management Branch, Planning Division.

79. Fryar, Joe B., Chief of Engineering Division.

80. Gould, Elisha, Chief of EPA Support Branch, Construction Division.

81. Grossman, Larry, Public Affairs Office.

82. Hunt, Robert, Senior Project Manager, Comprehensive River Basin Planning Section, Basin Management Branch, Planning Division.

83. Ignazio, Joeseph L., Chief of Planning Division.

84. Mahtesian, A., Chief of Civil Engineering Section, Design Branch, Engineering Division.

85. Maki, Robert, Chief of General Engineering Section, Design Branch, Engineering Division.

86. Mansini, Anthony, Chief of Design Section, Geotechnical Branch, Engineering Division.

87. McGondel, William H., Chief of Management Analysis Branch, Office of the Comptroller.

88. Morin, Cornelius T., Chief of Supervision and Inspection Branch, Construction Division.

89. Notardonato, Frank, Senior Project Manager, Project Management Branch, Engineering Division.

90. Ravens, Fred J. Jr., Chief of Design Branch, Engineering Division.

91. Reardon, Richard C., Chief of Project Management Branch, Engineering Division.

92. Scully, William C., Chief of Programs Office.

93. Swain, W., Chief of Plan Formulation Branch, Planning Division.